

A man wearing a yellow hard hat and safety glasses is working on a circuit board. The image is split vertically: the left side is dark with a faint line graph, and the right side is bright green with a faint circuit board pattern.

Microcredentials in flux

Challenges, opportunities and
insights from FSC's portfolio

Learning bulletin



Future Skills
Centre

Microcredentials in flux

Challenges, opportunities and insights from FSC's portfolio

Microcredentials -- rapid training programs that can help workers quickly master new skills or gain competencies -- are expected to play a major part in the future of skills training and education. These short, stackable, and targeted credentials have been heralded as a potentially effective way to meet the challenges related to workforce training in a fast changing economy.

The Future Skills Centre (FSC) has several pilot projects and research initiatives featuring training in the form of microcredentials. Through the data, lessons and insights generated by these projects, this Learning Bulletin summarizes our understanding of key issues and trends, introduces our investments in this area, and raises key questions for future research and practice.

Learning questions

1. How can microcredentials play a role in **smoothing the effects of rapid technological change** for different kinds of workers?
2. How can microcredentials **help revitalize struggling local economies**?
3. What role can microcredentials play in **industry-led workforce development**?
4. What opportunities exist in microcredentials **as an avenue for the advancement of underrepresented groups**?
5. How do the featured FSC project partners view the prospect of microcredential standardization?
6. What are the key issues, themes and questions for the future of microcredentials?

Introduction

The state of microcredentials

Workers, employers and policymakers face many challenges in a changing labour landscape: the accelerating pace of technological innovation; the rise in economic and workplace precarity; employment disparities among marginalized groups; the imperative to remain competitive across regional and global jurisdictions; and not least of all, the lasting impact of the COVID-19 pandemic on countless individuals, jobs, businesses and communities throughout the country.

Against this backdrop, policymakers working in the skills and education field have explored how to develop more effective and responsive skills development programs. As workforces face an ever greater need to upskill and reskill, microcredentials have emerged as a potentially useful tool to fill these gaps. In theory, microcredentials can build workers' skills with a relatively low cost and time burden and provide a rapid response to employers' skills needs, thus improving workers' ability to thrive in the agile and fast-paced labour markets of the future.

As a result, there has been a strong uptick in the supply of microcredential offerings from educational institutions, and a flurry of enthusiastic commentary on the subject. Despite growing energy and investment on the part of many stakeholders, however, some key components and evidence of a functioning microcredential ecosystem remain as yet undeveloped. For example, Canada lacks shared national definitions and standards, and it remains to be seen how these credentials are going to be institutionalized within and across various governments, industries and educational providers (Colleges and Institutes Canada, 2014). Moreover, for many workers, students and businesses, there is as yet no common accessible understanding of microcredentials – despite the fact that, when provided with a clear definition, many will express support for or interest in them. According to a recent Higher Education Quality Council of Ontario (HEQCO) survey, over 70% of Canadians interviewed say the lack of a definition makes it difficult for them to appreciate the value of microcredentials (Brumwell et al., 2021, p. 13).

For microcredentials to fulfill their expectations, they must be adopted across the economy as a whole, not only by credentialing institutions, but also by employers and industries at an everyday level. Without this wider adoption, their utility will necessarily be limited and their potential will remain untapped. This could potentially lead to a divergence of outcomes between sectors and industries (where there is a lack of broad recognition and portability for this form of credential) rather than the coherent, legible institutionalization of microcredentials throughout the Canadian labour market as a whole.

“For microcredentials to fulfill their expectations, they must be adopted across the economy as a whole.”

What is a microcredential? Available definitions and characteristics

While there is still no “common core” of pan-Canadian standards or a unified national “qualifications framework” as in other countries, there have been notable efforts to map out and define the scope of microcredentials in Canada and abroad.

In its 2021 report co-authored with partners in the Diversity Institute and eCampusOntario, the Future Skills Centre has subscribed to the definition of microcredentials as “a certification of assessed learning associated with specific and relevant skills or competencies. In their most developed forms, microcredentials are part of a “digital credentialing ecosystem.” –The Diversity Institute, eCampusOntario, Future Skills Centre, 2021 (Chaktsiris et al., 2021)”

However, a range of definitions created by policy makers and practitioners now exists. (see Box 1)

Box 1. Defining “microcredentials”

Some examples

A microcredential is a representation of learning, awarded for completion of a short program that is focused on a discrete set of competencies (i.e., skills, knowledge, attributes), and is sometimes related to other credentials. –Higher Education Quality Council of Ontario, 2021 (Brumwell et al., 2021, p. 1)

A microcredential is a certification of assessed competencies that is additional, alternate, complementary to, or a component of a formal qualification. –Colleges and Institutes Canada, 2021 (Colleges and Institutes Canada., 2021, p. 1)

Sub-unit of a credential or credentials (could be micro, meso, mini, etc.) that could accumulate into a larger credential or be part of a portfolio. –MICROBOL, European Union (MICROBOL, 2021)

Microcredentials verify, validate and attest that specific skills and/or competencies have been achieved and are endorsed by the issuing institution, having been developed through established...governance processes and designed to be meaningful and high quality. [They] may represent credit or non-credit study; they may take the form of a digital badge or micro-award, and can be offered online, on-campus, or a hybrid of both. –State University of New York (State University of New York, 2021)

Although there is no universally-agreed upon official definition, the available definitions converge on certain themes and characteristics:

- the short, competency-focused nature of microcredentials;
- their stackability with each other and complementary relationship with larger, conventional credentials;
- the status of recognition or validation they confer on the part of an issuing institution;
- and their mode of delivery, with some emphasizing the digital or online components found in many microcredential offerings.

FSC therefore defines a microcredential as a focused certification issued by a recognized institution conferring some measure of competence in a given area.

Join our community of practice

Learn more from and exchange with our project partners in this virtual space that brings together practitioners in the skills training ecosystem. [Create your account today!](#)



How are Canada's provinces and territories approaching microcredentials?

The establishment of provincial and pan-Canadian standards for microcredential accreditation is at a very early stage, with Canada's myriad provincial and territorial education systems being a potential complicating factor. Provincial governments across the country have expressed support for the development and expansion of microcredential offerings in different ways:

- **British Columbia** announced \$5 million to fund “35 microcredentials aligned with government and labour market priorities” (Ministry of Advanced Education and Skills Training, 2021);
- **Ontario** expanded Ontario Student Assistance Program (OSAP) to include 600 microcredential programs (Ministry of Colleges and Universities, 2021);
- **Quebec**'s Fédération des cégeps piloted a digital badge program in five select institutions that ended in 2017 (Fédération des cégeps, 2016);
- **Alberta** announced a microcredential pilot program in partnership with post-secondary institutions and industry to provide dozens of offerings (Government of Alberta, 2021).

As of this writing, there have been no announced efforts by provincial or territorial governments to issue pan-Canadian standards, although some expert organizations have sought to establish principles to shape the creation of these offerings.

In Canada, the most prominent example comes from eCampusOntario, which issued a list of principles to guide the development of microcredentials in the province. These were: relevance to the job market, verifiability by issuing bodies, ownership by learners, and extensibility with other credentials (eCampusOntario, 2019). CIC Canada and its partners have also collaborated to form a Pan-Canadian Microcredentials Standards Committee, which is working on its own set of guiding principles (Colleges and Institutes Canada, 2021).

These efforts indicate growing interest on the part of experts and policymakers for going beyond the descriptive phase and issuing prescriptive guidelines to influence the evolution and development of microcredentials in certain directions. For a comparative perspective with international jurisdictions and an overview of their experiences and views on microcredential standardization, see “Microcredentials are surging in popularity, but how should they be shaped?” by FSC staff on *Policy Options* (Mwaba, Baldwin, Richter, 2022).

FSC's investments in understanding microcredentials

Given the wider context, FSC is keenly aware of the importance of building knowledge and testing the extent to which microcredentials offer an innovative solution for workers and employers in the area of skill development. However, it is important to acknowledge the importance of the macro view of jurisdictions and institutions, which encompasses questions of standardization.

FSC's work is focused on developing learning around how everyday stakeholders (namely workers and employers) are experimenting with microcredential offerings to fill practical needs and niches. FSC is working with several partners who are deploying microcredentials as part of their skills training (see Box 2). These projects are testing microcredentials in the service of addressing a number of pressing real-world questions with diverse social, economic and technological dimensions. While they will provide critical insight on the micro-dimensions of impact (such as the extent of uptake and longer-term impact on workers' careers and incomes), they may also generate cues and signals about patterns of standardization and institutionalization of microcredentials across diverse Canadian education and employment systems¹.



1 *Unless otherwise cited, all information is taken from internal FSC files, interviews, and project-submitted literature.

Box 2. Key FSC projects exploring microcredentials

Title: [Material Handling 4.0: Building pathways to employment for disadvantaged groups](#)

Lead Organization: Mohawk College

Description: The project is testing microcredentials as a potential approach for supporting vulnerable workers in the material handling industry. It focuses on training 243 individuals for the vital material handling sector and consists of six weeks of training followed by a two-week work placement with a partner employer and accompanied by wraparound supports.

Total Investment: \$3 million

Title: [Digital Fluency for the Workforce Stackable Microcredentials](#)

Lead Organization: Humber College

Description: The project is testing the viability of a microcredential based on the recognition of prior digital learning (i.e., the Ontario College sector's Prior Learning Assessment & Recognition or PLAR) as an accessible means of digital upskilling. It aims to meet learners at their level of competency while allowing them to fill in gaps in their knowledge, in line with employer needs.

Total Investment: \$957,000

Title: [EDGE UP 2.0: A Scaling Opportunity](#)

Lead Organization: Calgary Economic Development

Description: This project is testing whether digital upskilling microcredentials can act as a bridge to transition displaced professionals from employment in one industry (oil and gas) into another (tech).

Total Investment: \$5.5 million

Title: [A Young, Northern Workforce Enters the World of ICT](#)

Lead Organization: University College of the North

Description: This project is testing whether a work-integrated-learning intensive program tailored toward addressing Northern and remote rural learning needs can deliver tangible results in those communities. If so, this model, which contains microcredential components, may serve regions affected by similar challenges (stemming from distinct geographic and cultural factors) throughout northern Canada.

Total Investment: \$996,300

Title: [CCAA Microcredentialing: Accelerating Skills Development for Canada's Aviation and Aerospace Industry](#)

Lead Organization: Canadian Council for Aviation & Aerospace

Description: This project is exploring if this microcredential model can serve as a workforce development solution for industries (particularly ones undergoing similar processes of restructuring) looking to cultivate agile, resilient, and multi-skilled workforces fit for the post-pandemic economy.

Total Investment: \$1,535,595

Title: [Leveraging Technology to Develop Modern Mining Skills](#)

Lead Organization: NORCAT

Description: This project aims to test whether this integrated/blended microcredential model can have a scalable impact on the capacity of skilled labour industries to quickly design and deploy workforce development programs.

Total Investment: \$1.3 million

Title: [Pay-for-Performance in Manufacturing](#)

Lead Organization: Social Research and Development Cooperation

Description: By combining a customized certification training program with an outcomes-based funding model, this innovative project aims to test whether the right incentives can increase employer investment in workforce development.

Total Investment: \$1.64 million

What we are learning

In this learning bulletin, we will explore five key questions which are informing our investments and approaches in the area of microcredentials.

Learning Question #1: How can microcredentials play a role in smoothing the effects of rapid technological change for different kinds of workers?

In the coming years, countless industries and occupations are projected to undergo periods of severe disruption, in large part due to rapid technological change. Statistics Canada research predicts that about “10.6% of Canadian workers were at high risk (probability of 70% or higher) of automation-related job transformation in 2016, while 29.1% were at moderate risk (probability of between 50% and 70%),” (Frank & Frenette, 2020). These larger patterns are expected to have a disproportionately pronounced impact on disadvantaged and marginalized groups.

FSC is working with two projects that are exploring microcredential-driven approaches to supporting vulnerable workers in the midst of technological change, potentially equipping them with the up-to-date skills and competencies needed to adapt to changing conditions.

“Material Handling 4.0: Building pathways to employment for disadvantaged groups” -- from Mohawk College and partner colleges throughout Canada

In this project, **Mohawk College’s City School in Hamilton, Ontario and its partner institutions are testing whether microcredentials can serve as an accessible means for supporting the career advancement of vulnerable workers in the material handling industry.** City School is joined in this endeavor by: Nova Scotia Community College in Halifax, Red River College in Winnipeg, and Vancouver Community College.

The material handling industry covers storage and movement of goods across factories, warehouses and distribution centres. It is a vital economic sector with a historically low-wage, and now aging workforce. The accelerating integration of new disruptive technologies into the supply chain has led to an emerging skills gap that could complicate the ability of firms to attract needed labour in the near future. A report for the 2019 Toronto Chief Digital Officers summit on the adoption of digital and advanced technologies in Canada indicated that among roughly 7000 Canadian firms surveyed, there was a 44% adoption rate for advanced Material Handling technologies, attesting to the scale of change emanating from this sector as well as the scale of opportunity (Beaudry et al., 2019).



This project aims to address the projected shortage of skilled labour in the material handling field by training a workforce drawn from disadvantaged groups. The training is focused on skills to work in the material handling industry of the future, defined by more sophisticated technologies as well as by more complex protocols in reporting and management.

Mohawk College and its partner institutions are testing the creation of novel grading criteria to inform micro-certification for these next-generation material handling competencies, leveraging the institutions' positions as leading technical education providers, as well as incorporating input from employers and industries.

The pilot program now underway consists of six weeks of training followed by a two-week long work placement with a partner employer, and accompanied by wraparound supports. Once implemented and if successful, the program's rubric may serve as a template for similar microcredentialing programs which operate at the nexus between oncoming technological change, skills and labour shortages, shifting employer demand and vulnerable workforces.

As of this writing, there are some indications that this program is meeting the needs of workers and employers. The project has seen 18 students complete Material Handling 4.0 as of the last reporting period from July to September 2021, with these participants acquiring successful placements in the industry and long-term employment outcomes; 21 more students have been recruited in this same period; the program has shown a strong retention rate; evaluation is planned by or after project end date of May 31, 2022.

“Digital Fluency Stackable Microcredentials for the Workforce” – from Humber College

Humber College has defined digital fluency as: “A spectrum of skills required to successfully navigate, understand and adapt to the constantly evolving digital age, with the addition of transferable soft skills and mindsets (related to critical thinking, confidence, problem solving and comfort with ambiguity).” Digital fluency has long been recognized as a key foundational skill set for the 21st century economy, but Canadian industries continue to face skilled labour shortages as a result of a digitally underequipped workforce. By the same token, job seekers ready and willing to fill this shortage are thwarted by a lack of digital fluency skills, pointing to gaps in the existing skills training ecosystem.

The costs to national productivity are steep. The lack of adequate digital fluency skills was estimated to slow productivity by about 21%, a \$65 billion loss to Canada’s economy (Hadziristic, 2017, p. 23). Humber College has stepped forward with a potential solution to this ongoing problem -- a “Digital Fluency Stackable Micro-credential.”

Humber College is testing the viability of a microcredential offering based on the recognition of prior digital learning (i.e., the Ontario College sector’s Prior Learning Assessment & Recognition, or PLAR) as a practical method of digital upskilling. This approach meets learners at their level of competency while allowing them to identify and fill in gaps in their knowledge. Humber has partnered with industry and community groups in the development of the curriculum, ensuring that the microcredential is focused on digital competencies that are most reflective of employer and industry needs. Humber College will assess the effectiveness of the microcredential program through two key methods: by conducting student surveys to obtain student’s perceptions on how the training has increased their employability, and by tracking students’ employment outcomes.

From these two projects, FSC will generate evidence about the suitability of microcredentials as a proposed resolution to issues of technological disruption. The increasing complexity of workplace technologies and their anticipated effects across the labour market call for more nimble and adaptive forms of training than those found in traditional degrees: it would also call for continued collaboration between post-secondary institutions and employers to determine the form and content of that training. The microcredential programs offered by Mohawk College and Humber College are informed by these insights and will be valuable in providing evidence for Canadian stakeholders.

As of this writing, more than 300 unemployed learners have taken up the program. Data from the first cohort shows that 187 microcredentials have been awarded to 74 out of the 89 learners, and early data on outcomes in employment is being gathered. An evaluation is planned by or after the project end date of May 31, 2022.

“Microcredentials could solve problems faced by regional economies from the adverse effects of global competition, technological disruption and demographic shifts.”

Learning Question #2: How can microcredentials help revitalize struggling local economies?

Microcredentials could also be part of the solution to the problems faced by regional economies exposed to the adverse effects of global competition, technological disruption and demographic shifts. Short, accessible and competency-focused offerings can grant workers in affected sectors the chance to either upskill and re-enter their chosen industries with up-to-date competencies, or to reskill and enter new fields and industries, allowing these workers to change and grow along with the regional economy.

Provincial and local governments, credentialing institutions, businesses and other relevant stakeholders know better than anyone the needs, wants, strengths and weaknesses of their jurisdiction and may collaborate to create and disseminate such microcredential offerings. FSC can point to two projects that fit the bill of regional industry or sector-specific microcredentialing programs built on partnerships between local stakeholders, which may serve as templates for future efforts at regional revitalization.

EDGE UP 2.0 – from Calgary Economic Development and partners

With support from the Future Skills Centre, Calgary Economic Development is exploring a microcredential project in Calgary, Alberta. In this region, oil and gas workers have borne the brunt of fluctuations within the oil and gas industry. Research from TD Bank predicts that up to three quarters of workers in this industry, or 50 to 70 percent (around 312,000 and 450,000 people) could be out of a job as Canada moves toward net zero emissions by 2050 (The Canadian Press, 2021) just as local tech firms are faced with a shortage of workers with digital competencies.

This project is testing whether digital upskilling microcredentials can act as a bridge to transition displaced professionals from employment in one industry (oil and gas) into another (tech).

After a successful first iteration in which 70 per cent of participants are employed in the tech sector or are in further education, EDGE UP 2.0 looks to build on that achievement. It is developing its microcredential offering utilizing the input from employer consultations and surveys to determine the most effective upskilling strategies and to assist participants.

Early-stage data gathered thus far shows some promise. In the last reporting period from July to September 2021, 116 new participants have been enrolled; completion data indicates that training is progressing according to plan with local partners like the University of Calgary, Southern Alberta Institute of Technology and Bow Valley College, and that the project is on track to meet its goal of seeing 80 per cent of participants go on to employment and/or further education. Career support continues to be offered to participants in need, and an evaluation is planned by project end date of June 30, 2023.

A geographically-focused, sector-specific program such as EDGE UP 2.0 may provide a template for transitioning workforces displaced by industry-level changes in other regional, demographic and economic contexts across the country.



A Young, Northern Workforce Enters the World of ICT – from University College of the North

Remote, rural and northern regional economies struggle to attract talent and educational investment, particularly in the Information Technology sector, which has seen a “brain drain” to cities in the south. The University College of the North (UCN) in Northern Manitoba has identified the issues confronted by northern communities as one of “jobs without people and people without jobs.” **This project is testing whether a work-integrated-learning intensive program tailored to addressing Northern and remote rural learning needs can deliver tangible results in those communities. If so, this model, which contains microcredential components, may serve regions affected by similar challenges (stemming from distinct geographic and cultural factors) all throughout northern Canada.**

UCN is addressing these problems by providing entry-level IT training that incorporates work-integrated learning (WIL) experiences and microcredential certifications for northern and Indigenous youth. Named Information Technology Readiness North (InTeRN), the program seeks to develop frontline IT technicians who can serve the needs of northern communities while enriching the talent pool available to companies operating in the region. The project revolves around a 10-month InTeRN program designed to impart the necessary IT competencies alongside a range of social supports via a flexible short-term delivery format that affords students the chance to return to their families and home communities.

This project could inform how local institutions can begin addressing employment and educational disparities in remote communities, and how shorter duration training programs that incorporate WIL and stackable microcredentials – particularly ones with wraparound social supports and training tailored to servicing remote regions – can be a part of the solution.

As of this writing, InTeRN has worked with more than 30 participants. A core of seven students has committed to the entire program and is receiving industry-based work experience and mentorship from across Canada as well as several from the US. This FSC-funded project is scheduled to conclude in summer 2022. An evaluation is planned by or after the project end date, and lessons-learned and best-practices developed will be shared.

The two FSC-funded projects featured here offer real-world test cases of microcredential training programs geared toward the alleviation of regional labour market challenges. Southern Alberta and Northern Manitoba hold different regional economic profiles but the two are alike in that they face persistent structural, sectoral and demographic imbalances related to anemic growth rates and shrinking workforces. The utility of regionally-focused microcredentials as a solution to this problem is yet to be determined but these three projects can go a long way toward establishing that understanding.

Learning Question #3: Can microcredentials be an opportunity for industry-led workforce development?

Employer investment in workforce development in Canada has declined in the last few decades, falling by 40% from the 1990s to the early 2010s (Doyle & Lamb, 2017, p 15). The emergence of microcredentials has been identified as an opportunity for industry to reverse this trend and to take the lead in the provision of skills training for workers in ways that are efficient, flexible, targeted and cost-effective.

Industry consortia and industry-adjacent organizations are well placed to determine for their constituent members and stakeholders which skill sets and competencies they will need from their workers — and to have these demands reflected in skills training. They will know where current training models fall short and how gaps in the skills ecosystem can be filled. Indeed, employers and industry groups have been a significant part of the proliferation of microcredential offerings in recent years, both in terms of lending input to governments and educational institutions and in terms of directly providing the training themselves. FSC can highlight three projects in its portfolio that embody this positive trend of hands-on, industry-led workforce development.

“Industry is well placed to determine which skill sets and competencies their workers will need.”

CCAA Microcredentialing: Accelerating Skills Development for Canada’s Aviation & Aerospace Industry – from Canadian Council for Aviation and Aerospace

Canada’s aviation sector has been acutely affected by the COVID-19 pandemic. The industry shed approximately 35% of its prior workforce (Standing Committee on Industry, Science and Technology, 2021).

As the sector looks to streamline costs in the face of reduced revenues, interest has grown in efficient ways to upskill workers so that they can easily move between occupations within the industry. **The project is testing whether this microcredential model can serve as a workforce development solution for industries (particularly ones undergoing similar processes of restructuring) looking to cultivate agile, resilient, and multi-skilled workforces fit for the post-pandemic economy.**



As the body that handles the industry's national occupational standards and certification system, the Canadian Council for Aviation and Aerospace is best positioned to address this crisis. The CCAA is spearheading this 2-year project centering on a national microcredential program to facilitate greater skills transferability and movement of employees across the aviation and aerospace sector—as well as between industries that require comparable skill sets such as other transportation and advanced manufacturing sectors.

By the end of this microcredential program, workers can be expected to possess measurable skills and to enjoy greater mobility across occupations through national, industry-recognized certification standards. This project is expected to enable cross-functional career progression for workers. The microcredentials to be offered will combine training through a traditional academic curriculum with learning through practical, in-company experience, encompassing both the theoretical and practical aspects of workforce development. Its goal is the development of a new form and model of microcredential training that is in sync with the “flow-of-work” of a company.

The project can be of great relevance not only for aviation and aerospace but for other sectors as well, because of its emphasis on skills transferability and worker mobility across occupations.

As of this writing, there are some indications that this program is meeting the needs of workers and employers: Thus far, the project has created its system framework of skills taxonomies and developed the first 25% of immersive training bites; an evaluation is planned by or after project end date on March 31, 2023.)

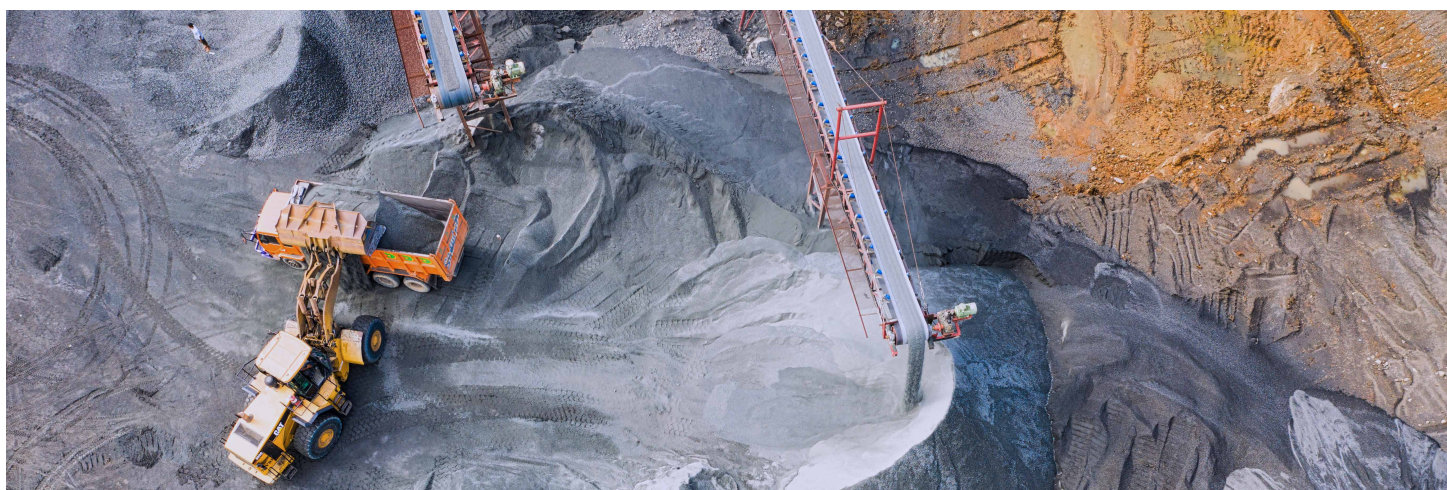
Leveraging Technology to Develop Modern Mining Skills – from NORCAT and partners

Canada's mining industry is confronting its own unique issues relating to labour shortages and the emergence of new technologies. In 2018, a report from the Mining Industry Human Resource Council projected that the Canadian mining industry will need to recruit 130,000 new workers over the next decade (Sudbury Mining Solutions Journal, 2018). Over this period, the set of technical skills and competencies of these workers will be expected to undergo significant change.

As a leading technology and innovation centre dedicated to preparing Canada's mining workforce for these challenges, NORCAT is developing a scalable microcredential offering based on its signature integrated approach to skills training. Through the experience and data generated, **this project aims to test whether this integrated/blended microcredential model can have a scalable impact on the capacity of skilled labour industries to quickly design and deploy workforce development programs.**

NORCAT will focus on the growing importance of sophisticated applications in the mining process (such as mechanized bolters, jumbo drills, and load-haul-dump machines, among others). As a means of immersing learners in the operation and handling of these machines, it will deploy a “blended training” approach that gives workers immersive learning experiences through integrating VR technology, equipment simulation, eLearning and practical onsite skills validation (which includes access to NORCAT's underground operating mine). NORCAT has a track record in training hundreds of workers using these methods and will incorporate its experience and insights into this unique, 21-month long microcredential program.

As of this writing, there are some indications that this program is meeting the needs of workers and employers: recruitment data shows 42 project participants enrolled; and an evaluation is planned by or after project end date of March 31, 2022.



Pay-for-Performance in Manufacturing – from Social Research and Demonstration Corporation (SRDC) and Excellence In Manufacturing Consortium (EMC)

The Canadian manufacturing industry of the future will need a workforce that is equipped with both “hard” technical skills and “soft” skills, such as knowing how to solve problems, working well with others, and communicating effectively. However, the manufacturing sector has been slow to invest in developing these skills in its current workforce. EMC’s labour market information survey, Manufacturing GPS, has shown that 30 percent of employers in manufacturing cannot point to any investment in their workers’ skills and development, while those employers who do invest in employee training do so at a much lower rate than other industries (Gray, 2020).

By combining a customized certification training program with an outcomes-based funding model, this innovative project aims to test whether the right incentives can increase employer investment in workforce development.

This FSC-funded project is led by the non-profit research organization Social Research and Demonstration Corporation (SRDC), in partnership with Excellence in Manufacturing Consortium (EMC). The project strives to encourage investment in training through an outcomes-based Pay for Performance (PFP) funding model. Customized to meet the needs of the manufacturing sector, the PFP model incentivizes employers to pay for training by minimizing risks, encouraging success, and compensating for productivity loss due to training.



“The Canadian manufacturing industry will need a workforce equipped with both hard technical skills and soft skills.”

The model was designed to support EMC's successful certification program, Manufacturing Essential Certification (MEC), which will be offered as a microcredential recognized by participating employers. This eight-week essential skills program was designed in close collaboration with industry leaders to address the skill needs of manufacturing workers. The training combines classroom learning with a Workplace Performance Project (WPP), whereby participants are given an opportunity to put their new skills into practice and work in a group to address real-world problems affecting their company's business objectives.

The accompanying Pay for Performance funding model asks employers to pay for the MEC training costs up-front. These businesses can claim partial reimbursement at certain milestones once agreed-upon outcomes have been reached.

As part of the project's evaluation, SRDC developed a logic model that clearly identifies the hypothesized causal connections between the funding scheme on the one hand and employer behaviour on the other. Currently, the project is in mid-implementation but as it nears completion (due to COVID-19, the project has sought extension beyond the original completion date of March 2022), SRDC and EMC will evaluate whether outcomes-based funding models can affect employer behaviours and thus increase their willingness to invest in their workers.

As of this writing, there continues to be strong demand from manufacturing companies for EMC's MEC program. Although recruitment was affected by the COVID-19 pandemic and the ensuing public health restrictions, 28 manufacturing companies have enrolled a total of 100 participants since the start of the project, including 54 new project participants in the second half of 2021. EMC has concluded the delivery of 7 training sessions. On average, participating companies have received 89% of their reimbursement amounts (meaning they completed 89% of expected outcomes); these amounts are equivalent to 62% of the direct training costs. A full evaluation of the project is planned by the project's end date.

Against the trend of underinvestment in workforce development on the part of the employer-side of the labour market, these three projects show how industry groups can take the lead in providing their workers with needed skills training in ways that meet the most pressing challenges faced by each respective industry (aviation, mining and manufacturing). The projects featured may provide formats and precedents for other sectors interested in developing their own microcredential offerings.

“Industry groups can take the lead in providing their workers with needed skills training to meet the most pressing challenges.”

Learning Question #4: Can microcredentials be an avenue for the advancement of underrepresented groups?

The microcredential projects featured here are premised on the proactive inclusion of socially and economically marginalized groups, in line with FSC's Diversity, Equity and Inclusion agenda (see Box 3).

Box 3. Demographic profile of participants

Mohawk College's Material Handling microcredential program has, in the last reporting period, recruited groups such as immigrants (8 participants), newcomers (4 participants), people without post-secondary education (11 participants), youth aged 15-29 (10 participants), and people with essential skills gaps (18 participants).

Humber College's Digital Fluency Microcredential is similarly targeted at equity-seeking groups and they have provided a demographic breakdown for the 323 students that have been involved in the program since the start: newcomers (those who arrived in Canada in the last 5 years), 24.5%; Youth (aged 15-29), 13.3%; racialized persons, 85.8%; people with essential skills gap, 14.2%; women, 74.6%; indigenous persons, 0.3%; refugees, 3.1%; immigrants, 74.0%; persons with disabilities; and deaf persons, 13.3%; older adults (65 years and older), 1.9%.

Calgary Economic Development's EDGE UP 2.0 has provided the following demographic breakdown for equity-seeking and underrepresented groups in their cohort, these include: newcomers (52 participants) and women (28 participants).

The University College of the North's InTeRN program is dedicated to northern/remote, Indigenous and female students, and in fact, all participants are from northern/remote regions and more than 60% are female. The seven students within InTeRN are all Indigenous females from northern Manitoba.

NORCAT's recruitment data shows the following demographic breakdown of its pool of participants: youth (aged 15-29), 25 participants; Indigenous peoples, 10 participants; women, 8 participants; people without post-secondary education, 27 participants; immigrants, 4 participants; racialized peoples, 6 participants; persons with disabilities, 6 participants.

CCAA's, NORCAT's and SRDC's projects are for workers in danger of displacement.

Documented disparities in education and employment opportunities continue to hold back these and other disadvantaged groups in Canadian society. The equity implications of microcredential offerings have therefore become a subject of interest among stakeholders and policymakers. Because they are short, flexible, more financially accessible and usually focused on specific in-demand competencies, this form of credential can potentially address systemic gaps in ways that more traditional and cost-intensive degree formats like bachelor's degrees and certificates cannot.

There is, however, the question of how microcredentials will be received in relation to these traditional degrees and whether they will be relegated to a secondary reputational tier of qualifications, as has been the case with earlier innovations like community colleges, thus condemning learners from marginalized groups to further divergence and stratification. Pizzaro Milian (2021) highlights this possibility even as he acknowledges that much of the energy and innovation in microcredentials comes from reputable institutions in education and industry, which would seem to preclude such a problem. But he also points out that “at the same time, there is no evidence [learners] will pursue untested micros as opposed to enrolling part-time in a [traditional] degree offered by the same organization.” A system in which they are recognized and transferable across institutions and in which they are stackable and complementary with macro-credentials would help to prevent such a scenario since it would enable a degree of continuity and connectivity with traditional degrees and thereby ensure that microcredentials are not cordoned off from the existing mainstream and that the students who take them “do not face unnecessary barriers to advancing their education” (Pizzaro Milian, 2021).

Other equity-related questions include how members of various marginalized groups perceive and interact with microcredentials, how this will affect their uptake, and how their attainment of microcredentials translates into outcomes in the labour market.

An upcoming literature review conducted by the Diversity Institute aims to shed light on the accessibility dimension of microcredentials and digital badges with respect to underrepresented groups like “women, visible minorities, Indigenous peoples, persons living with disabilities, and LGBTQ2S+ individuals.” It finds that “less has been done” in the research to understand the accessibility and inclusivity implications of microcredentials while suggesting “that more research is required and that more engagement, early in the developmental process, of people from underrepresented groups, is essential.” In light of the research and evidence gap identified by the Diversity Institute, these microcredential projects funded by FSC may contribute a great deal (Carroll et al., 2021 - draft).

“These projects can contribute to a more definitive understanding of microcredentials as a solution to the disparities faced by marginalized groups in Canada.”

Ultimately, the answers can only be determined once data is generated and analyzed from practical applications that test the validity of microcredentials as an avenue for the advancement of underrepresented groups. As these projects progress through their implementation stages, it will become possible to collect more precise data around how a particular microcredential offering has helped to uplift participants belonging to an underrepresented group. This knowledge may then inform future attempts at scaling up project designs toward larger and more permanent programs. Therefore, these FSC-funded projects, with their conscious and explicit concern for the causes of equity and inclusion, can contribute to establishing a more definitive understanding around microcredentials as a solution to the disparities faced by marginalized groups in Canada.

Learning Question #5: How do the featured FSC project partners view the prospect of microcredential standardization?

The topics of microcredential standardization and institutionalization are of great interest to the FSC partners and projects featured here. For the purposes of collecting this information, FSC’s Research and Knowledge Mobilization Department reached out to the partners with questions to gauge their thinking on the “bird’s-eye view” processes going on above and beyond the day-to-day operation of the projects. Partners have indicated a largely positive view toward the prospect of common standards and guidelines to govern how microcredentials are offered across occupations, industries and jurisdictions.

Some partners, particularly the post-secondary institutions covered here, have argued for taking a cautious approach based on concerns around flexibility (Mohawk College) and incrementalism (Humber College), while another (UCN) has pointed to the lingering resistance and hesitancy among some sectors toward what is still, in many respects, a new and untested credential. Post-secondary institutions emphasized the need for microcredential offerings to be clearly linked with industry and employer demand, a principle which is duly reflected in their respective microcredential offerings/project designs.

Among employer and industry-focused projects (CCAA, NORCAT and SRDC/EMC), support for the prospect of microcredential standardization and institutionalization was also positive, with these lead organizations expressing confidence in their capacities to lead and play an active part in that process. These organizations are interested in leveraging their various institutional strengths,

knowledge, experience and connections toward the larger goal of standardization not just within their respective sectors but between and across industries: all expressed a willingness to work with governments and stakeholders in pursuit of this and they were ready to share best practices and insights. Moreover, CCAA, NORCAT and SRDC were broadly supportive of the idea of creating a national, pan-Canadian database of microcredential offerings across industries for employers and employees to access and they indicated an interest in helping to shape and influence the process of establishing such a database.

Box 4. Views on standardization from FSC partners

While views on microcredential standardization may vary across different institutions and sectors, it is clear that this is a topic that weighs heavily on the thinking of partners and stakeholders. Efforts to advance the creation and dissemination of common standards around microcredentials should be guided by the experiences and insights generated by those institutions that are at the forefront of microcredential training, such as the ones featured here.

Mohawk College: With respect to standardization, project organizers say that Mohawk College would support the incorporation of microcredentials into the Provincial Qualifications Framework as it would aid in the establishment of a shared understanding and definition. However, organizers also note that in order to maintain a degree of flexibility, microcredentials would need to encompass a wide range of skill sets, while duration and admissions criteria have to be open, relatively speaking. The standards that govern microcredentials will accordingly have to make room for these variations.

Humber College: On the question of standardization, Humber College has commented that because “microcredentials differ from traditional credentials, there is a perception that a lack of standardization is a limiting factor to their potential. Therefore, it “views the impact and the development of microcredentials incrementally.”

The institution is “embedding microcredentials in current courses so that students may use microcredentials to spotlight skills of interest to employers; [Humber College is] further investigating long-term credential opportunities for pathways into traditional credentials.” However, it also believes that “While standardization may assist the latter, a lack of standardization does not necessarily impede these activities. Incorporation into the [Ontario Qualifications Framework] may occur over time. If it does, [Humber College’s] priority will be to retain the ability to develop and deliver MCs rapidly and responsively, relying on...proven institutional quality assurance processes to certify their effectiveness.

University College of the North: UCN’s perspective on standardization is informed by the following insights: “Acceptance by employers will largely dictate the acceptance of microcredentials by academia, but perhaps in only some sectors. For example, in the IT sector, employers are eager to see credentials (be they micro- or macro-) that are linked to recognized and needed industry-related skills. Other sectors (e.g., business) are interested in some microcredentials but also looking for a total package within the new employee.” However, UCN is finding “that the discussion changes when work-integrated-learning is included in the microcredential discussion (i.e., the conversation changes when we are talking about upskilling existing employees).”

UCN has also noticed that “Some sectors exhibit a resistance to microcredentialing.” But despite this, these sectors are willing to “engage on the issue of skills acquisition through work-integrated-learning and mastery demonstration.” This indicates that although there may be disagreement on the label, (microcredentials, badges, credit units) and on the question of how these credentials constitute an educational pathway for an individual learner, there is interest in some of the abovementioned concepts and characteristics underlying microcredential training.

Canadian Council on Aerospace and Aviation: As a leading industry organization, CCAA is well-positioned to shape norms and standards on how microcredentials are established as a universally recognized form of credential. The organization is open to working with governments, partners and stakeholders within aviation and aerospace but also with other sectors and industries. Project organizers at CCAA are conscious that microcredentials are still a new and relatively untested form of credential and that it will therefore be beneficial to all parties to exchange learnings and best practices. Project organizers see the CCAA as playing the role of convenor, collaborator and curator of knowledge with other industries, sectors and stakeholders.

Notably, project organizers at the CCAA would support the institution of common standards across Canada and the establishment of a single database for storing and exchanging information on microcredentials since: it sees its microcredential offering as imparting skills that are adaptable to other sectors and industries. They believe that the CCAA, with its extensive network of industry association partnerships and members, could work with other organizations and their respective networks to ensure a Canada-wide distribution of this content.

NORCAT: The project organizers would be interested to share best practices and learning with stakeholders. They would highlight NORCAT’s subject matter expertise on training methods with relevance for microcredential development, such as the delivery of a blended learning environment that incorporates both in-person, instructor-led training and technology-driven, AR/VR/SIM learning. They also note that these methods and approaches have broad applicability across many sectors and industries.

Project organizers have also expressed interest and support for the establishment of a database of microcredential offerings. As project organizers see it, from the employer perspective: Microcredentials are a new phenomenon and employers understandably want to see how these short program offerings can be leveraged to advance their workers’ ongoing education and engagement — and how such an investment can work to the firm’s competitive advantage.

Social Research and Demonstration Corporation: SRDC believes that microcredentials will “become increasingly necessary as companies adopt new technologies or adapt to political demands and social transformation.” This makes the question of standardization more pressing. Having a common standard that is widely accepted will enhance the value and marketability of microcredentials by “providing proof of skill acquisition that will be recognized by employers.”

Building on its experiences, SRDC believes that “conducting rigorous needs assessments with various partners within an industry, from senior management to front line workers, is the best way to truly understand the skill gaps of workers and how they can best be addressed to meet business goals.” Accordingly, the organization “would encourage other stakeholders to follow a similar approach when developing flexible learning options, including microcredentials, and common standards.”

SRDC would also be in support of a national database of microcredentials, since it recognizes that “access to clear information about education and training options (and financial assistance to support adult learning) is necessary to encourage adults to retrain or increase their skills.” As to how this database should come about, SRDC believes that it will “require collaboration between provincial/territorial governments (who are responsible for credentialing), as well as industry (who can identify needs). But all of this should be done in response to workers’ expressed preferences for accessing information (e.g., online or at work, through their employer or directly from an institution).”

What's next

The micro and macro view on microcredentials

Key issues, themes and questions for the future of microcredentials

Taking the micro view of microcredentials means looking at how this form of credential performs in the face of real-world labour market issues confronted by ordinary Canadian workers and employers at an everyday level. The microcredential projects featured here were conceived as ways to address some of those issues related to technological disruption, regional economic decline, employer underinvestment in workforce development and, not least, the plight of marginalized and underrepresented groups. Taking this view would also mean looking at these issues from the perspective of a displaced factory worker in Ontario, an Indigenous IT student in Northern Manitoba or an engineer in Alberta and asking questions such as: “is this microcredential going to work for me and my needs in terms of accessibility, affordability and career advancement?” “How does it compare with traditional degree offerings?” “Are employers in my city or region going to respond positively to the presence of microcredentials on my CV?” “Will they readily recognize it as a reliable signal of the skill sets and competencies they need?”

Taking the macro view means looking at the more abstract and specialized topic of microcredentials as it is understood by a more select audience consisting of policymakers, labour market experts, industry leaders. It means asking bigger picture questions about microcredentials at an institutional level, such as: “Are microcredentials, by and large, performing well and delivering on their promise?” “What do statistics say about their uptake and success rate among workers, employers and other stakeholders?” “What would it look like for them to be standardized across institutions, industries and jurisdictions — and what would be the pros and cons of having common standards?” “How would this process play out given the country’s decentralized education system?” This specialized audience will have an outsized say in these larger questions about the future of microcredentials and will benefit from having reference to the experiences and insights produced by the FSC-funded projects featured here.

Putting these two views together may lead to a more complete sense of the present state and future direction of microcredentials. To the extent that a project produces a clear and positive result at the micro-level view, such as a cohort of successfully employed learners from a marginalized group or a scalable model for employer reskilling in a particular industry, it will be easier to determine the path of microcredential institutionalization at the bird’s eye view — all the better for reproducing those individual project successes at a broader scale.

As more information materializes, policymakers and stakeholders can work towards a future where microcredential offerings will have markers of quality, reliability and legibility, just as is the case with traditional degrees. This will be seen in both formal standardization and cultural acceptance for workers, employers and learners of all kinds. Just as certificates, bachelor's and graduate degrees evince a society-wide understanding as to what they are and what purposes they serve, microcredentials may someday become a comparably well-established part of the educational system as well. The more that microcredentials prove useful at solving practical problems and filling persistent gaps in the labour market, the more likely this outcome can be.

Past the question of standardization, remaining key issues and themes can be grouped around: **stackability and transferability between institutions, employer recognition**, and **real impact for workers**--all of which may form the basis of further research and inquiry.

Whether the microcredential enterprise lives up to the hype and achieves its potential as a game-changer in skills training and education, or whether it ends up as a passing novelty, will depend on the policy and regulatory frameworks upon which governments and stakeholders agree. It is beyond the scope of this Learning Bulletin to suggest what exact form microcredential standardization should take, but the FSC-funded projects profiled here and the learnings distilled from them may aid and encourage that process.

“The more that microcredentials prove useful to solve problems and fill gaps in the labour market, the more likely they may someday become a well established part of the educational system.”

References

- Beaudry, C., Hage, G., Thierren, P., Adoption of digital and advanced technologies in Canada. Retrieved from: https://munkschool.utoronto.ca/ipf/files/2019/04/Hage-Beaudry-Therrien_Technology-Adoption-summary_final.pdf
- Brumwell, S., Han, S., Pichette, J., & Rizk, J. (2021, May 5). Making Sense of Microcredentials. Retrieved from <https://heqco.ca/pub/making-sense-of-microcredentials/>
- Chaktsiris, M., Cukier, W., Gareffa, N., Gooch, E., Luke, R., McCallum, K., Patterson, L. Is the Future Micro? Unbundling learning for flexibility & access. Retrieved from: <https://fsc-ccf.ca/research/is-the-future-micro-unbundling-learning-for-flexibility-access/>
- The Canadian Press. (2021, April 6). Three-quarters of oil and gas sector jobs could be displaced by 2050 in move to cut emissions: TD report. Retrieved from: <https://www.cbc.ca/news/canada/calgary/oil-gas-petroleum-displaced-td-report-jobs-lost-net-zero-1.5976515>
- Carroll W., Braswell, M., Kay, W., Bona, M., LaPierre, J., & Pellerine, M., (2021, December 17). Do micro-credentials and digital badges increase access to higher education for students in underrepresented groups? A preliminary scan of the evidence (Internal draft from the Diversity Institute).
- Colleges and Institutes Canada. (2021, April). The Status of Microcredentials in Canadian Colleges and Institutes. Retrieved from <https://www.collegesinstitutes.ca/policyfocus/micro-credentials/>
- Conference Board of Canada. (2019). Provincial Outlook Long-Term Economic Forecast: 2019. Retrieved from: <https://www.conferenceboard.ca/e-library/abstract.aspx?did=10089>
- Doyle, S. & Lamb, C. (2017). Future-proof: Preparing young Canadians for the future of work. Retrieved from: http://www.rbc.com/community-sustainability/_assets-custom/pdf/FINAL-FP-report-Online.pdf
- eCampusOntario. (2019, October 7). Micro-certification Principles and Framework. Retrieved from: <https://www.ecampusontario.ca/wp-content/uploads/2019/10/2019-10-07-microcertifications-en3.pdf>
- European Micro-Credential Terminology. (2021). MICROBOL. Retrieved from: <https://microcredentials.eu/terminology/>
- European Commission. (2020, December). A European Approach to Micro-credentials. Retrieved from: <https://education.ec.europa.eu/sites/default/files/document-library-docs/european-approach-micro-credentials-higher-education-consultation-group-output-final-report.pdf>
- Expert Panel for the Review of the Australian Qualifications Framework. (2019, September 30). Review of the Australian Qualifications Framework. Retrieved from: <https://www.dese.gov.au/higher-education-reviews-and-consultations/resources/review-australian-qualifications-framework-final-report-2019>
- Fédération des cégeps. (2016). Stratégie numérique en éducation et en enseignement supérieur – Le réseau collégial, une vision à l'ère du numérique. Retrieved from: <https://fedecgeps.ca/memoire/2016/12/strategie-numerique-en-education-et-en-enseignement-superieur-le-reseau-collegial-une-vision-a-lere-du-numerique/>

- Frank, K. & Frenette, M. (2021, June 29). Automation and Job Transformation in Canada: Who's at Risk? Retrieved from: <https://www150.statcan.gc.ca/n1/pub/11f0019m/11f0019m2020011-eng.htm>
- Government of Alberta. (2021, August). Alberta 2030: Building. Skills for Jobs New micro-credential learning opportunities, Retrieved from: <https://www.alberta.ca/new-micro-credential-learning-opportunities.aspx>
- Gray, W. (2020). Training Investment Declining! – EMS Newsroom. Retrieved from: <https://www.emccanada.org/newsroom/training-investment-declining>
- Hadziristic, T. (2017, April) The State of Digital Literacy in Canada: A Literature Review. Retrieved from: https://brookfieldinstitute.ca/wp-content/uploads/BrookfieldInstitute_State-of-Digital-Literacy-in-Canada_Literature_WorkingPaper.pdf
- Ministry of Advanced Education and Skills Training. (2021, September 28). Micro-credentials a gateway to support B.C. workers. Retrieved from: https://archive.news.gov.bc.ca/releases/news_releases_2020-2024/2021AEST0060-001869.htm
- Ministry of Colleges and Universities. (2021, March 18). Ontario Expands Financial Assistance to Include Micro-credentials. Retrieved from: <https://news.ontario.ca/en/release/60792/ontario-expands-financial-assistance-to-include-micro-credentials>
- Mohawk College. (2021). Annual Report 2020/2021. Internal FSC documentation.
- Mwaba M., Baldwin, N., Richter, S., (2022, March) Micro-credentials are surging in popularity, but how should they be shaped? Retrieved from: <https://policyoptions.irpp.org/magazines/micro-credentials-training-education/>
- New Zealand Qualifications Authority. (2021). Micro-credentials. Retrieved from: <https://www.nzqa.govt.nz/providers-partners/approval-accreditation-and-registration/micro-credentials/>
- Pizzaro Milian, R. (2021, June 30). Back to Basics? Facilitating the Recognition of Micro-credentials in Ontario PSEs. Retrieved from: <https://jipe.ca/index.php/jipe/article/view/92/34>
- Quality Assurance Agency for Higher Education. (2021, April 16). Quality Compass: Which Way for Micro-credentials?. Retrieved from: https://www.qaa.ac.uk/docs/qaa/news/quality-compass-which-way-for-micro-credentials.pdf?sfvrsn=25c6d481_8
- Standing Committee on Industry, Science and Technology. (2021). Meeting – EVIDENCE Tuesday, March 23, 2021. Retrieved from: <https://www.ourcommons.ca/DocumentViewer/en/43-2/INDU/meeting-24/evidence>
- State University of New York. (2021). Micro-credentials at SUNY. Retrieved from: <https://system.suny.edu/academic-affairs/microcredentials/>
- Sudbury Mining Solutions Journal. (2018). Solving the HR challenge in the mining industry. Retrieved from: <https://www.sudburyminingsolutions.com/commentary/solving-the-hr-challenge-in-the-mining-industry-1606087>
- University College of the North. (2019). Network Computer Technology Work-Integrated-Learning; a young, northern workforce enters the world of ICT employment. Internal FSC documentation.



The Future Skills Centre (FSC) is a forward-thinking centre for research and collaboration dedicated to preparing Canadians for employment success. We believe Canadians should feel confident about the skills they have to succeed in a changing workforce. As a pan-Canadian community, we are collaborating to rigorously identify, test, measure, and share innovative approaches to assessing and developing the skills Canadians need to thrive in the days and years ahead. The Future Skills Centre was founded by a consortium whose members are Ryerson University, Blueprint ADE, and The Conference Board of Canada, and is funded by the Government of Canada's Future Skills Program.

**Ryerson
University**

**The Conference
Board of Canada**

Blueprint



Author

Michael Cuenco is a Research Associate at the Future Skills Centre. His writings on various public policy issues have been published in Canadian, US and UK outlets including Policy Options, National Post, The Monitor, American Affairs and UnHerd, and his work has additionally been cited in The Globe and Mail and New York Magazine. Michael graduated from the University of Toronto's Munk School of Global Affairs and Public Policy with a Master of Global Affairs degree in 2020.

If you would like to learn more about this bulletin and other skills research from FSC, visit us at fsc-ccf.ca or contact Michael at michael.cuenco@fsc-ccf.ca

Canada

Microcredentials in flux: Challenges, opportunities and insights from FSC's portfolio is funded by the Government of Canada's Future Skills program.

The opinions and interpretations in this publication are those of the author and do not necessarily reflect those of the Government of Canada.

Publication Date:

March 2022

