



Future Skills Centre

Centre des Compétences futures

NAVIGATING NET-ZERO:

Faculty Perspectives on Greening Post-Secondary Curricula



BUSINESS + HIGHER EDUCATION ROUNDTABLE



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 Toronto Metropolitan University, Blueprint ADE, and The Conference Board of Canada, and is funded by the Government of Canada's Future Skills Program.



Navigating Net-Zero: Faculty Perspectives on Greening Post-Secondary Curricula 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.



The Business + Higher Education Roundtable (BHER) is a non-partisan, not-for-profit organization bringing together some of Canada's largest companies and leading post-secondary institutions. BHER is the only organization in Canada that brings together leaders from the country's top companies and post-secondary institutions to build a better social and economic future for all. We are a national leader in member-driven change and work collaboratively to tackle some of Canada's biggest skills and talent challenges. Learn more at www.bher.ca.

Acknowledgements

Thanks to Sarah-Kim Holma, Senior Researcher, and Steve Higham, Senior R&D Manager, for data collection, analysis, and report writing. Additional thanks to Andrew Bieler, Director of Partnerships and Experiential Learning, for strategic direction and feedback; Sunny Chan, Senior Content Specialist, for her writing and editing expertise; Nouran El Atreby, Junior R&D associate, and Husaina Lakdawala, R&D Intern, for supporting the project along the way. Val Walker, BHER's CEO and Matthew McKean, BHER's Chief R&D Officer, directed and oversaw the project.

Publication Date:

April 2024

Table of Contents

1

Executive Summary

4

Context

2

Introduction

7

Findings

3

**Research Project
Overview**

Executive Summary

Sectors connected to the green economy face skills gaps and talent shortages across the globe. In Canada, the need ranges from basic climate literacy for entry-level employees to advanced competencies for technically-specific roles.

Canada's post-secondary institutions have a critical role to play in ensuring new grads and mature workers have the in-demand skills and knowledge required for the transition to a net-zero economy.

Post-secondary responses to climate change, though, have focused more on campus operations (e.g., reducing emissions from campus buildings) than on aligning educational practices (e.g., curricula, pedagogy) with the needs of an emerging green economy.

Why? This report seeks to understand some of the barriers and opportunities related to “greening” teaching and learning. We spoke with post-secondary stakeholders involved in academic planning and development at public colleges, polytechnics, and universities across Canada who are committed to integrating sustainability into courses and programs.

What we found was that faculty members across disciplines agree on the necessity and importance of adapting curricula to address climate literacy and green skills, but express differing views on curriculum development priorities. In other words, there was no consensus within our sample when it came to approaches to integrating green skills into curricula but general consensus that the process is usually slow.

Opportunities exist to layer in institutional support and professional development for instructors and faculty who are working to address net-zero goals. Opportunities also exist to develop business and higher education partnerships to address sustainability skills training and experience gaps.

We suggest that work-integrated learning, in particular, could help strengthen communication and collaboration between post-secondary institutions and industry while also improving alignment for institutions looking to ensure graduates are ready for green jobs.

At the end of the report, we included examples of successful work-integrated learning partnerships to indicate their important role as part of the green skills transition.

Introduction

This project was completed during the summer and fall of 2023, when the impacts of climate change were being acutely felt in communities across Canada. The worst wildfire season in recorded history, influenced by climate change¹, forced thousands to evacuate entire cities.² Heatwaves, flash-flooding, and other extreme weather events further underscored the urgent need for Canada and the world to act.

Canada needs to meet its goal of net zero emissions by 2050, while hitting ambitious targets for reducing greenhouse gas emissions over the next decade.³ Achieving these targets and successfully transitioning to a net-zero economy will require workers with the skills and knowledge needed to fill green jobs.

The demand for people with specialized skills for green jobs already exists. A recent scan of job postings found opportunities related to wastewater processing, renewable energy, and solar power, among other essential vacancies.⁴ Estimates suggest that more than three million Canadian jobs will change in some way over the next decade due to the transition, and that between 13% and 20% of these jobs will be in new occupations to meet our net-zero goals.⁵

Climate change education is also part of Canada's international commitments, including the UN Sustainable Development Goals (SDG 4.7), Action for Climate Empowerment (ACE), and the Paris Agreement. As a signatory to these climate agreements, Canada has committed to providing education and training to address climate literacy and promote sustainability.

There are nuances between teaching about the practical solutions to climate change (e.g. sustainable technologies and net-zero goals) and teaching about why these practical solutions are needed (e.g. climate literacy). While most Canadians acknowledge climate change is happening, only 51% of Canadians feel well-informed about climate change, and 86% indicated they need more information about it.⁶

Green skills are most effective when built on a foundational understanding of their context and importance. It's important, then, that post-secondary institutions (PSIs) not only provide green skills training but also improve climate literacy. Canada's companies also have a role to play, and collaboration between PSIs and industry will be critical.

This report asks: how are PSIs integrating green skills, climate literacy, and green career pathways into their programming? What barriers are they facing? And what support do they need to be more responsive to emerging green economy needs?

Research Project Overview

Background

PSIs have a unique role in tackling climate change: they are tasked with preparing students for a job market that is being profoundly disrupted by the transition to net zero. How they organize their infrastructure, teaching and learning, industry and community partnerships impacts this transition on local, national, and global scales.

Our approach focuses exclusively on the perspectives of post-secondary stakeholders involved in curriculum development. The goal is to contribute to an emerging body of research on the barriers and opportunities PSIs face in meeting emerging green skills needs.

Challenges related to aligning post-secondary curricula with green skills needs may also inform further research on the respective roles of the private sector and different levels of government in supporting PSIs.

Methods

We began this project in the winter of 2022. We started with a scan of background research, including a literature review of peer-reviewed and gray sources. We extracted and synthesized qualitative data and themes from existing literature and looked for gaps in knowledge. We then undertook a web-based environmental scan to identify sustainability and green skills stakeholders.

We conducted key informant interviews with instructors, faculty members, and stakeholders involved in academic planning at public PSIs across Canada, representing colleges, polytechnics, and universities. More than 20 formal, 60-minute interviews occurred in the spring and summer of 2023.

The Research Ethics Board at Toronto Metropolitan University approved this project's research methodology, data plan, and research instruments.

Context

Green skills and green jobs

The term “green skills” is used to encompass a combination of technical skills, knowledge, values, and attitudes required in the workforce to develop and support sustainable social, economic, and environmental outcomes in business, industry, and the community.⁷

According to Vona, et al.,⁸ there are two main sets of green skills: engineering skills for the design and production of technology, and managerial skills for implementing and monitoring environmental organizational practices. The skills considered green vary depending on the needs of a given job or sector.

A recent report from the International Labour Organization shows that the transition to sustainable economies requires both technical and human skills, and that gaps and shortages in these skills “may constitute a constraint on the transition to an environmentally sustainable economy.”⁹

Jobs considered to be “green” (i.e., ones that contribute to preserving or restoring the environment)¹⁰ require high-level cognitive and interpersonal skills.¹¹ Often called human skills, sometimes called “social and emotional” skills, they include abilities, characteristics, and behaviours such as leadership, cultural competence, problem-solving, resiliency, collaboration, and communication.¹² Green jobs also require technical skills (i.e. those connected to specific tasks), which might include construction techniques or the operation of green technology.

Across the globe, sectors connected to the green economy are facing skills gaps and talent shortages.¹³ Within Canada, data show existing skills shortages in the energy and natural resource sectors, construction, and manufacturing.¹⁴ Employers are looking for graduates who can help them “green” their operations or develop more sustainable products or services.

Canada’s employers are looking for talent versed in climate literacy and possessing analytical and technical skills, innovation skills, communication skills, adaptability, and environmental awareness.¹⁵ A private sector leader put it this way: “If this generation is going to own the future, being climate literate is a basic part of running our economy and running our society in the future.”¹⁶

Higher education and net-zero

Typically, the field of sustainability in higher education recognizes five key domains: 1. Education; 2. Research; 3. Campus Operations; 4. Community Outreach; and 5. Governance. In a recent Universities Canada survey, 75% of universities have dedicated sustainability strategies,¹⁷ and many have developed initiatives to implement the UN Sustainable Development Goals (SDGs).¹⁸

A growing number of Canadian colleges and universities have achieved top rankings in the Association for the Advancement of Sustainability in Higher Education (AASHE)'s 2022 Sustainable Campus Index.¹⁹ ECO Canada recognizes 33 accredited environmental programs at colleges, polytechnics, and universities that align with the needs of the environment and resource sectors specifically.²⁰

More broadly, over 250 programs of study and certifications are offered in sustainability at Canadian universities,²¹ many of which focus on systems thinking, strategic competence, interpersonal competence, anticipatory competence, and normative competence — an approach markedly different from the more industry-led focus on green technical skills.

Additionally, the major associations representing post-secondary institutions — Colleges and Institutes Canada, Polytechnics Canada, and Universities Canada — have each recognized sustainability and action for net-zero as priorities, offering resources and best practices to support their member institutions. Groups like Canadian Colleges for a Resilient Recovery, University Climate Change Coalition, Sustainable Development Solutions Network Canada, Can Adapt, International Universities Alliance, Monitoring and Evaluating Climate Communication and Education (MEECE), and The SDG Accord provide further examples of national and international collaboration to promote sustainability and climate action among PSIs.

Can Adapt, for example, is a capacity-building hub that provides institutions and individuals with a platform for training and education related to adaptation. They offer resources, communities of practice, and information about competencies and courses. Royal Roads University in Victoria is a member. The International Universities Climate Alliances is an important hub for climate research and collaboration. McGill University in Montreal is a member. Meanwhile, MECCE is an ambitious international research partnership initiative with more than 100 scholars and agencies working together to advance global climate literacy and action by improving the quality and quantity of climate change education and training, including in relation to green skills.

Another sign of progress: most accredited PSIs in Canada have an on-campus sustainability office. These offices often develop or support initiatives to reduce carbon emissions, promote energy efficiency, reduce waste, promote sustainable transportation, and, in many cases, integrate sustainability into curricula. Overall, Canadian PSIs have made impressive progress over the past two decades in developing plans and strategies to reduce their carbon footprint. But more needs to be done to strengthen the emphasis placed on sustainability and climate action not only in campus operations but within teaching and learning activities.

An analysis of self-reported data from the Sustainability Tracking, Assessment & Rating System (STARS) shows that the national average of students graduating from programs with at least one sustainability learning outcome is only 37%.²² Most university graduates are not receiving an education that helps them understand the connection between their areas of study and climate sustainability. One key reason is that courses and programs focusing on climate change and sustainability are frequently clustered in specific disciplines, particularly education, environmental science, and certain STEM programs.²³

The need for interdisciplinary approaches to teaching and learning on sustainable development and climate change is increasingly highlighted as a national priority by Canada's researchers.²⁴ Overwhelmingly, stakeholders we spoke with recognized the urgency of the climate crisis, and the need to increase their institutional research capacity and strategically align their teaching mission with net-zero goals. As one faculty member put it, "I don't think we can any longer pretend we're in the world we were in 10 years ago. We're in a different world and we must shift. We must redesign what we offer students."²⁵

In their 2022 study of sustainability-themed student work placements, Onyido, et al. explain: "While sustainability is being included more and more in university curricula, it is, to a significant extent, still treated like a separate discipline all on its own, or as an obligatory add-on to other courses, rather than as a key mainstream feature across university learning programmes."²⁶ Pressure for PSIs to equip students with climate literacy, green skills, and a general awareness of climate change and sustainability comes from many sources beyond students and staff. In *Universities on Fire: Higher Education in the Climate Crisis*, Alexander Bryan notes: "Local or national governments may request or mandate more coursework on climate change ... funders, both private and public, can also incentivize climate teaching."²⁷

To meet the growing demand for green skills and respond to emerging skills gaps, PSIs must now do more than reduce their campus footprint and provide add-on courses on climate change; they must strengthen student and faculty awareness of climate change, sustainability, and potential green career paths across a broader range of disciplines.²⁸ This is especially important for equity-deserving student populations, since research indicates that women²⁹ and international students³⁰ have less awareness of green career paths, and face barriers in accessing opportunities to develop green skills and gain relevant experience.

Findings

For this report, we spoke with faculty members, instructors, and other stakeholders at public PSIs to better understand what they identify as barriers to meeting net-zero goals, and what they perceive to be the primary drivers in strengthening the teaching and learning of green skills and climate literacy. The next section discusses what we found.

Key finding #1

Net-zero goals continue to challenge PSIs to change, adapt, and be agile.

Institutional agility is a well-known challenge. The process of updating courses or programs to include climate change and sustainability content is time consuming. A faculty member from an Ontario-based university pointed out an institutional reluctance to build new programs to replace older legacy ones and noted: “There can be a lot of red tape when it comes to getting curricular changes approved, particularly if you’ve got an accredited program.... They would rather see the existing programs evolve than to see new programs launched.”³¹

Agility was recognized as a challenge regardless of institute type.³² Research on strategies for advancing institutional changes towards sustainability, though, highlights the importance of committed individuals.³³ We heard from multiple stakeholders that the process of modifying or creating new courses or programs requires individuals who have the passion and determination to navigate complex, sometimes slow processes.

We also heard from a polytechnic faculty member who shared their success with curriculum adaptation that was based on passionate faculty members who care about climate change. They said: “it started as a grassroots approach movement.”³⁴ Another faculty member pointed out that the pandemic showed the ability of PSIs to work quickly and collaboratively “to address an imminent societal threat” when given the funding and mandate to do so.³⁵ Evidence supports the potential for faculty to form committees to address net-zero goals if they are passionate, determined, and supported by leadership.

In contrast to other institutions, college programs are often directed by provincial ministries in course content and program accreditation, limiting the extent to which faculty can adapt or update content without going through a broader approval process. We heard one example where the process of establishing a new program stream to focus on sustainability took over a decade. Planning, obtaining approvals, securing accreditation for new programs, accessing funding — all these steps require a great investment of time and energy on the part of individuals.

Among all institution types, faculty members indicated that support from leadership was a necessary precondition to establishing an institutional culture where climate change, sustainability, and green skills are incorporated into courses and programs. One stakeholder commented: “Staff don’t know how to do this alone ... trying to embed a new framework of thinking and systems thinking on sustainability ... there’s different levels to which things can be integrated, and different challenges within each of those approaches.”³⁶

Key finding #2

Change requires committed leaders, passionate faculty, and students. Students themselves are often the driving force for institutional change when it comes to climate action.

One professor noted: “I think young people, students, are incredibly powerful actors right now.”³⁷ Part of this stems from greater awareness and concern about the climate crisis. Compared with other age groups, young people (aged 18-34) are more likely to recognize the climate crisis as a priority,³⁸ which itself is a strong motivator to act.

Student activism has contributed to institutional divestment, campus-based initiatives, and increasingly, curricular changes. Globally, student activism has driven the establishment of mandatory courses on the climate crisis, along with training programs for academic staff.³⁹ In Canada, at Concordia University and Université Laval, students voted in favour of mandatory programming for all students to learn about sustainability and the climate crisis via curriculum.⁴⁰

Evidence supports that students at PSIs also recognize the importance of developing green skills to strengthen their employability for future jobs. One professor said: “I think current students are better informed about what’s going on, and there’s a bit more of an expectation (for climate education). And if you look at what the future careers are, where the big growth and careers will be, it’s all in the green economy and renewables, so that’s where they want to go.”⁴¹

Key finding #3

Increased professional development was continually cited as necessary to support faculty in their personal and professional transition to net zero and teaching green skills.

Teaching climate literacy may fall outside of many educators’ specialization. Research shows that among educators at the K-12 level, just 34% feel they have the knowledge and skills to teach about climate change.⁴² Among post-secondary educators, our interview results suggest a comparable lack of confidence.

As a curriculum development expert at a community college told us: “Faculty don’t have the professional development to teach these courses or to integrate sustainability into their courses. And we’re expecting them to just know what sustainability is...and then be able to teach it to students.”⁴³

Suggestions to support faculty ranged from workshops to support faculty and instructors interested in incorporating climate knowledge, sustainability or green skills into their teaching and research activities to communities of practice where educators and sustainability stakeholders can connect, share ideas and best practices, and hear from guest speakers.

Developing communities of practice and providing safe spaces for instructors to share and debrief were also cited as ways of responding to the challenges they may encounter. Some faculty highlighted a need for professional development in classroom management around climate change topics, which is directly related to the challenge of teaching about the realities of climate change amid developing climate communication skills.

Conversations can trigger feelings of stress, sadness, or eco-anxiety in the classroom. Research shows that among young Canadians, more than half report feeling afraid, sad, anxious, and powerless about climate change, and 78% report that climate change impacts their overall mental health.⁴⁴

A recent CIGan report claimed: “As students from colleges and institutes across the country graduate and enter the workforce, equipping them with the appropriate mental health literacy tools and an understanding of how to access support when needed is critical to building a healthy, resilient, and prosperous workforce in Canada.”⁴⁵

Some faculty members we spoke with discussed the need to provide students with “trigger warnings” and strategies for coping: “We had started scaffolding and cueing students to say, trigger-warning! This is going to be really challenging ... students reported that it was important to get the hard truth, but also to have the cueing so that they could prepare themselves....”⁴⁶

Teaching about climate change can also be polarizing as conversations around net zero and a “just transition” can be controversial,⁴⁷ particularly in regions where the livelihoods of learners and their families are threatened by shifts away from oil and gas consumption. Misinformation and conspiracy theories related to climate change further contribute to polarization,⁴⁸ and often deter educators from engaging altogether.

Finally, our conversations with stakeholders also reveal that faculty would like recognition when they do have impact on reaching net-zero milestones. At a panel convened by BHER at the Cannexus23 Conference, one participant stated: “If you want more sustainability, incentivize ... leadership today and tomorrow means drawing that line for you and your people to get to the goal that you want and making sure the incentives are aligned.”⁴⁹

Key finding #4

There’s no one-size-fits-all approach to embedding climate knowledge into higher education.

There is no single roadmap for expanding climate curricula in higher education. Our interviewees differ in their approaches to integrating sustainability into the curricula.

Some want to apply a climate lens to whatever is taught so that students understand how all topics relate to climate change and sustainability: “I would argue that every single topic that is taught in higher education needs to contain some sustainability criteria and interconnectedness.”⁵⁰

Others want to introduce a mandatory course for incoming faculty and students to ensure they receive a basic level of knowledge, recognizing that overhauling all curriculum is too extreme and comes with too many risks: “... not all institutions have the resources for that, and I think it would be a big, big ask for everyone to engage on those issues.”⁵¹

One professor acknowledged that students “need a systemic level understanding of where climate change fits generally with the environment,”⁵² but asserted that not all faculty members and instructors are educated in ways that recognize these connections. It also appears that big changes to higher education may present unforeseen challenges to even the most adaptive institutions given their current capacity, or lack thereof.

More specific, proven curricular interventions for PSIs looking to embed climate knowledge into programming might include campus-based projects tailored to the surrounding campus community and environment; and the establishment of “living labs” in connection with local industry to enable applied learning to develop green skills and empower students to act on climate change.

Increasingly, micro-credentials are being developed with greater agility than curriculum-based courses. Micro-credentials can provide opportunities for learners to adopt green skills and climate literacy. Canadian Colleges for a Resilient Recovery (C2R2) recently announced that its member institutions will deliver more than 100 new micro-credential courses to help workers develop skills for specific roles in a net-zero economy.⁵³

Interviewees also recommended an increase in climate-related minors program options. These could involve combining existing courses across disciplines to give the learner a foundation of knowledge related to climate change and sustainability.

Finally, PSI communities may benefit from thematic campus events (“Week of Climate Action”) where students, faculty, and leaders are encouraged to participate in efforts to take climate action and strengthen climate literacy.

Key finding #5

Campus “sustainability people” can guide and prepare departments, liaise between various institutional levels, and connect with Indigenous and industry stakeholders to support curriculum development.

Another idea we heard was for PSI leaders to mobilize multidisciplinary teams to support SDGs and climate education via a department-specific “sustainability person.”⁵⁴ Having a sustainability professional articulate what skills are in demand within the labour market may also foster a direct line between industry and academia and “help students understand their own skills and their skills gaps around climate action.”⁵⁵ This could remove some strain from faculty.

CICan’s recent report, “Adapting Infrastructure to Face Climate Change,” recommends a nationwide investment of 50 college sustainability centres to meet Canada’s climate goals. They propose that sustainability centres can mobilize students, SMEs, and communities to act; leverage college assets and link sustainability centres in related sectors; scale up rapid reskilling and upskilling; support colleges in sharing expertise, tools, and resources to enable knowledge transfer; and seize business opportunities and drive innovation with a climate lens through applied college research. They argue that sustainability centres may also function as living labs that use renewable energy and clean building technologies to further Canada’s climate-resiliency efforts.⁵⁶

Sustainability offices can connect stakeholders across disciplines and advance sustainability and climate action across all fronts with a format suited for the institution’s structure. In a recent census of all 220 Canadian accredited PSIs, the Sustainability and Education Policy Network found that 73 institutions currently have a sustainability office or officer.⁵⁷

A variation on the theme: we also heard the suggestion that institutions develop a dedicated “sustainability trifecta” of individuals working to advance sustainability across operations, academics, and student services. This model could address the fact that sustainability offices can find it hard to balance the many requests placed on staff and can be understaffed.

Applying individual or teams of sustainability experts to guide departments in transitioning curriculum has added value if these experts can liaise with Indigenous groups to enhance curriculum development. Several of our interviewees referenced the connection between Indigenous ways of learning and knowing and efforts to promote sustainability.⁵⁸

More generally, we heard from stakeholders about the opportunities to strengthen approaches to teaching by better incorporating diverse perspectives. It helps, too, when post-secondary sustainability offices work with or near to equity offices.

Key finding #6

PSI-employer partnerships allow both sides to develop programming and pathways for in-demand green skills and jobs.

Opportunities exist for industry to collaborate with PSIs to design and implement programs to prepare students for the green economy.⁵⁹ But that will require growing and evolving how industry and PSIs communicate and work together to tackle what are ultimately shared priorities.

PSIs can help industry sectors understand field-related shifts in innovation and research, while businesses can identify opportunities to offer feedback and input into course design to help prepare for emerging skills needs.⁶⁰

Industry can play a significant role, too, in helping students develop green skills by providing training and work-integrated learning (WIL) opportunities for students, along with job opportunities for graduates in emerging green sectors.⁶¹

Partnering with businesses and community groups to create green WIL opportunities can help PSIs “short-circuit” challenges related to agility and program responsiveness to industry needs.⁶² Research suggests that integrating sustainability and climate study across disciplines may in fact require experiential learning systems,⁶³ and WIL opportunities with a sustainability focus are an effective way of improving graduate employability skills.⁶⁴

WIL allows students to apply the skills and knowledge they learn through coursework and make it more concrete. A faculty member from a Quebec-based university explained that students often question the relevance of sustainability curricula in the classroom, but when put into practice, it is understood: “I think experiential learning is important, especially with sustainability accounting because for some of our students ... we’re just up there in the clouds and not on our feet, not on the ground, I mean, they’re just saying I will never see this in my practice. I don’t understand why I should spend time on that.”⁶⁵

Endnotes

- 1 Barnes, C, Boulanger, Y, Keeping, T, Gachon, P, Gillett, N, Boucher, J, Roberge, F, et al. "Climate Change More than Doubled the Likelihood of Extreme Fire Weather Conditions in Eastern Canada." World Weather Attribution, August 21, 2023. <https://www.worldweatherattribution.org/climate-change-more-than-doubled-the-likelihood-of-extreme-fire-weather-conditions-in-eastern-canada/>.
- 2 CBC. "95% of Yellowknife Has Now Been Evacuated Due to N.W.T. Wildfires." August 18, 2023. <https://www.cbc.ca/news/canada/north/northwest-territories-update-news-conference-wildfire-evacuations-1.6941214>.
- 3 Service Canada. "2030 Emissions Reduction Plan: Clean Air, Strong Economy," March 29, 2022. <https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/climate-plan-overview/emissions-reduction-2030.html>.
- 4 The Conference Board of Canada. "Toward a More Sustainable Future: Preparing the Students of Today for a Greener Tomorrow-2023." Accessed August 28, 2023. <https://www.conferenceboard.ca/in-fact/toward-a-more-sustainable-future/>.
- 5 Colin Guldemann and Naomi Powell. "Green Collar Jobs: The Skills Revolution Canada Needs to Reach Net Zero." RBC Economics and Thought Leadership, February 16, 2022. <https://thoughtleadership.rbc.com/green-collar-jobs-the-skills-revolution-canada-needs-to-reach-net-zero/>.
- 6 LSF. "Canadians' Perspectives on Climate Change & Education: 2022." <https://lsf-ist.ca/research-policy/survey/>.
- 7 Kamis, Arasinah, Ridzwan Che Rus, Mohd Bekri Rahim, Faizal Amin Nur Yunus, Normah Zakaria, and Haryanti Mohd Affandi. "Exploring Green Skills: A Study on the Implementation of Green Skills among Secondary School Students." International Journal of Academic Research in Business and Social Sciences 7, no. 12 (January 8, 2018): 327–45.
- 8 Vona, Francesco, Giovanni Marin, Davide Consoli, and David Popp. "Environmental Regulation and Green Skills: An Empirical Exploration" Journal of the Association of Environmental and Resource Economists 5, no 4" (April 17, 2023). <https://www.journals.uchicago.edu/doi/10.1086/698859>.
- 9 "Skills for a Greener Future: A Global View." Publication. Geneva, Switzerland: International Labour Organization, December 12, 2019. http://www.ilo.org/skills/pubs/WCMS_732214/lang--en/index.htm.
- 10 "What Is a Green Job ?," April 13, 2016. http://www.ilo.org/global/topics/green-jobs/news/WCMS_220248/lang--en/index.htm.
- 11 Consoli, Davide, Giovanni Marin, Alberto Marzucchi, and Francesco Vona. "Do Green Jobs Differ from Non-Green Jobs in Terms of Skills and Human Capital?" Research Policy 45, no. 5 (June 1, 2016): 1046–60. <https://doi.org/10.1016/j.respol.2016.02.007>.
- 12 Giammarco, Maria, Stephen Higham, and Matthew McKean. "The Future Is Social and Emotional: Evolving Skills Needs in the 21st Century." The Conference Board of Canada, March 2020.
- 13 "Making the Green Recovery Work for Jobs, Income and Growth." OECD, 2020. <https://www.oecd.org/coronavirus/policy-responses/making-the-green-recovery-work-for-jobs-income-and-growth-a505f3e7/>.
- 14 Statistics Canada. Table 33-10-0300-01 Skill shortages, by industry and enterprise size Statistics Canada, 2023. <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3310030001>.
- 15 Handayani, Mustika N., Mohamad Ali, and Dinn Wahyudin Mukhidin. "Industry Perceptions on the Need of Green Skills in Agribusiness Vocational Graduates." Journal of Technical Education and Training 12, no. 2 (March 26, 2020): 24–33.

- 16 “Net zero: What’s the role of post-secondary institutions?” Panel discussion, Cannexus23 Conference. Ottawa, ON. January 23, 2023
- 17 “Action for Net Zero - Universities Canada.” Accessed May 25, 2023. <https://www.univcan.ca/priorities/action-for-net-zero/>.
- 18 Beveridge, Dan, Marcia McKenzie, Philip Vaughter, and Tarah Wright. “Sustainability in Canadian Post-Secondary Institutions.” *International Journal of Sustainability in Higher Education* 16, no. 5 (November 2015): 611–38. <https://doi.org/10.1108/IJSHE-03-2014-0048>.
- 19 “Over 20 Canadian Postsecondary Institutions Rank Highly in AASHE’s 2022 Sustainable Campus Index” *Academica Group-Research and Consulting for Higher Education*. Accessed May 25, 2023. <https://www.academica.ca/top-ten/over-20-canadian-postsecondary-institutions-rank-highly-aashe%E2%80%99s-2022-sustainable-campus>.
- 20 ECO Canada. “Our List of Post-Secondary Accredited Programs.” Accessed April 27, 2023. <https://eco.ca/educators/program-accreditation/current-programs/>.
- 21 “Action for Net Zero” Universities Canada. Accessed May 25, 2023. <https://www.univcan.ca/priorities/action-for-net-zero/>.
- 22 “Sustainability Curriculum” EnufCanada. Accessed September 5, 2023. <https://enufcanada.ca/sustainability-curriculum/>.
- 23 Onyido, Tochukwu Ben C., Zoe Allman, Pamela Hardaker, Deepa Rughani, and Allan Letinov. “Embedding Sustainability in University Work Experience Placements: A De Montfort University Model.” *Education + Training* 64, no. 8/9 (January 1, 2022): 1037–59. <https://doi.org/10.1108/ET-09-2021-0356>.
- 24 Ann Dale, Lenore Newman. “Sustainable Development, Education and Literacy.” *International Journal of Sustainability in Higher Education*, December 1, 2005. <https://www.emerald.com/insight/content/doi/10.1108/14676370510623847/full/html?queryID=24%2F5412841>.
- 25 Interview. University faculty member. June 2, 2023.
- 26 Onyido, Tochukwu Ben C., Zoe Allman, Pamela Hardaker, Deepa Rughani, and Allan Letinov. “Embedding Sustainability in University Work Experience Placements: A De Montfort University Model.” *Education + Training* 64, no. 8/9 (January 1, 2022): 1037–59. <https://doi.org/10.1108/ET-09-2021-0356>.
- 27 Alexander, Bryan. *Universities on Fire: Higher Education in the Climate Crisis*. JHU Press, 2023 (p.89).
- 28 Mark Chapeskie. “Canada Is Investing in Green Jobs for Youth — but It Needs to Get the Word out | Canada’s National Observer: News & Analysis.” *National Observer*, October 30, 2020. <https://www.nationalobserver.com/2020/10/30/opinion/canada-green-jobs-for-youth-awareness>.
- 29 White, Yasmin, Tom Bradley, Beccy Packer, and Emily Jones. “Skills for a Net-Zero Economy: Insights from Employers and Young People.” *WorkSkills UK*, June 24, 2022. https://www.worldskillsuk.org/wp-content/uploads/2022/06/GreenSkillsReport-2022_v3b.pdf.
- 30 Castelino, Lauren. “Youth Perceptions on Securing Green Jobs: An Equity Perspective.” *Policy Brief*. York University, December 2021.
- 31 Interview. University faculty member. June 2, 2023.
- 32 Interview. University faculty member. July 28, 2023.

- 33 Hoover, Elona, and Marie K. Harder. "What Lies beneath the Surface? The Hidden Complexities of Organizational Change for Sustainability in Higher Education." *Journal of Cleaner Production*, Bridges for a more sustainable future: Joining Environmental Management for Sustainable Universities (EMSU) and the European Roundtable for Sustainable Consumption and Production (ERSCP) conferences, 106 (November 1, 2015): 175–88. <https://doi.org/10.1016/j.jclepro.2014.01.081>.
- 34 Interview. Polytechnic faculty member. June 2, 2023.
- 35 Interview. University faculty member. June 7, 2023.
- 36 Interview. University faculty member. June 2, 2023.
- 37 Interview. University faculty member. June 7, 2023.
- 38 Solutions, Evoke, and Unite for Change. "75% of Canadians Worry about Climate Change and Its Impacts." Unite for Change, April 20, 2023. <https://uniteforchange.com/en/blog/environment/75-of-canadians-worry-about-climate-change-and-its-impacts-21-having-fewer-or-no-children-as-a-result/>.
- 39 Burgen, Stephen. "Barcelona Students to Take Mandatory Climate Crisis Module from 2024." *The Guardian*, November 12, 2022, sec. World news. <https://www.theguardian.com/world/2022/nov/12/barcelona-students-to-take-mandatory-climate-crisis-module-from-2024>.
- 40 Verity Stevenson. "Should All Undergraduate Students at Concordia Learn about the Climate Crisis? | CBC News." CBC, November 15, 2021. <https://www.cbc.ca/news/canada/montreal/universities-climate-crisis-1.6248677>.
- 41 Interview. College faculty member. July 14, 2023.
- 42 Schwartzberg, P., Stevens, J., & Acton, K. S. "Canadians Perspectives on Climate Change and Education: 2022." *Learning for a Sustainable Future*, 2022. <https://lsf-ist.ca/wp-content/uploads/2023/03/Canadians-Perspectives-on-Climate-Change-and-Education-2022-s.pdf>.
- 43 Interview. University faculty member. May 19, 2023.
- 44 Galway, Lindsay P., and Ellen Field. "Climate Emotions and Anxiety among Young People in Canada: A National Survey and Call to Action." *The Journal of Climate Change and Health* 9 (January 1, 2023): 100204. <https://doi.org/10.1016/j.joclim.2023.100204>.
- 45 "Enhancing student mental health at Canada's public colleges and institutes" *Colleges and Institutes Canada*, January 2023. <https://www.collegesinstitutes.ca/media-and-resources/submissions-reports/>
- 46 Interview. University faculty member. June 7, 2023.
- 47 Anderson, Drew. "A War of Words over 'Just Transition' Is Just the Beginning." *The Narwhal*, January 16, 2023. <https://thenarwhal.ca/alberta-just-transition/>.
- 48 News, Nick Logan · CBC. "Why Do Wildfires Often Ignite a Firestorm of Conspiracy Theories? | CBC News." CBC, August 16, 2023. <https://www.cbc.ca/news/world/maui-wildfire-conspiracy-theories-1.6937745>.
- 49 "Net zero: What's the role of post-secondary institution." Panel discussion, Cannexus23 Conference. Ottawa, ON. January 23, 2023
- 50 Interview. University faculty member. June 7, 2023.
- 51 Interview. University faculty member. June 14, 2023.

- 52 Interview. Polytechnic faculty member. June 13, 2023.
- 53 Mohawk College. “Quick Train Canada Offers Fully Funded Training for Upskilling, Reskilling Workers across the Country,” August 29, 2023. <https://www.mohawknewsdesk.ca/quick-train-canada-offers-fully-funded-training--for-upskilling-reskilling-workers-across-the-country/>.
- 54 Interview. College faculty member. June 13, 2023.
- 55 Interview. University faculty member. May 19, 2023.
- 56 “Adapting Infrastructure to Face Climate Change: Colleges and institutes’ leadership in driving Canada’s transition to a net-zero and climate resilient infrastructure sector” College and Institutes Canada. June 2023. <https://www.collegesinstitutes.ca/media-and-resources/submissions-reports/>
- 57 “Post-secondary Education Sustainability Initiative Census Scores.” The Sustainability and Education Policy Network. October 2023. <https://sepn.ca/resources/data-post-secondary-institution-census-scores/>
- 58 Interview. Polytechnic faculty member. July 13, 2023
- 59 Heong, Yee Mei, Lai Chee Sern, Tee Tze Kiong, and Mimi Mohaffyza Binti Mohamad. “The Role of Higher Order Thinking Skills in Green Skill Development.” Edited by T. Deaconescu and A. Deaconescu. MATEC Web of Conferences 70 (2016): 05001. <https://doi.org/10.1051/mateconf/20167005001>.
- 60 CEDEFOP. “Green Skills and Environmental Awareness in Vocational Education and Training,” June 18, 2012. <https://www.cedefop.europa.eu/en/publications/5524>.
- 61 Colin Guldemann and Naomi Powell. “Green Collar Jobs: The Skills Revolution Canada Needs to Reach Net Zero.” RBC Economics and Thought Leadership, February 16, 2022. <https://thoughtleadership.rbc.com/green-collar-jobs-the-skills-revolution-canada-needs-to-reach-net-zero/>.
- 62 Khampirat, Buratin, Carver Pop, and Suniti Bandaranaike. “The Effectiveness of Work-Integrated Learning in Developing Student Work Skills: A Case Study of Thailand.” *International Journal of Work-Integrated Learning* 20 (2019): 126–46.
- 63 Onyido, Tochukwu Ben C., Zoe Allman, Pamela Hardaker, Deepa Rughani, and Allan Letinov. “Embedding Sustainability in University Work Experience Placements: A De Montfort University Model.” *Education + Training* 64, no. 8/9 (January 1, 2022): 1037–59. <https://doi.org/10.1108/ET-09-2021-0356>.
- 64 Whelan, Michael Barry, and Amanda Reichelt-Brushett. “Using Internship Placements to Road Test Threshold Learning Outcomes for Environment and Sustainability.” *Journal of Teaching and Learning for Graduate Employability* 10, no. 2 (May 31, 2019): 36–49. <https://doi.org/10.21153/jtlge2019vol10no2art783>.
- 65 Interview. University faculty member. June 14, 2023



Future Skills
Centre

Centre des
Compétences
futures



**BUSINESS
+ HIGHER
EDUCATION**
ROUNDTABLE