Barriers (for Women) in Science, Engineering, Trades and Technology (SETT) Education

Introduction

Approaches to Science, Engineering, Trades and Technology (SETT) education in Canada are a many-splendoured thing. Diversity across each stream of SETT is just one facet of its "many-splendouredness." Other factors contributing to SETT variability include Canadian federalism, heterogeneity across and within provincial/territorial educational jurisdictions, inter-provincial, trade-specific certification/accreditation requirements, planning to meet SETT needs (labour market, sectoral needs), labour force homogeneity within SETT streams - which hampers youth ideation of SETT careers and related possibilities, role models and educational inclusion - and a range of approaches to coordination/communication.

Educational participation rates in SETT are among the factors affecting participation in the labour force downstream. For instance, Colleges and Institutes Canada reported that while 34% of STEM degree-holders are women, they make up only 23% of Canadians working in science and technology positions.[1] Similarly, women held 12% of the apprenticeship registrations in Canada in 2023 (note that this includes female-dominated fields like early childhood education, hairstyling/esthetics, community/social services with 96%, 86% and 86% of registrations, respectively),[2] but make up just over 8% of skilled trades workers.[3] Having said that, this report is focused on comparing/contrasting SETT education across federal/provincial/territorial jurisdictions; the important work of analysing gender dynamics within the SETT workforce is outside of the scope of this research.

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[1] Cited in "By the Numbers: Exploring Women's Presence in Canadian Colleges and Institutes," Colleges and Institutes Canada, March 8, 2024, https://www.collegesinstitutes.ca/by-the-numbers-exploring-womens-presence-in-canadian-colleges-and-institutes/#:~:text=And%2C%20while%2034%25%20of%20Canadians%20with%20a,science%20and%20technology%20roles%20.

[2] "Table 37-10-0219-02, Number and percentage of apprenticeship program registrations by age group, major trade group, sex and registration status," Statistics Canada, release date 2024-12-11, modified 2025-07-12, https://doi.org/10.25318/3710021901-eng.

[3] Cited in Emily Baron Cadloff, "With Demand for Skilled Trades Soaring, More Women Join the Ranks," theglobeandmail.com, May 13, 2025, https://www.theglobeandmail.com/business/article-with-demand-for-skilled-trades-soaring-more-women-join-the-ranks/#:~:text=In%202022%2C%20Statistics%20Canada%20reported,when%20tracking%20began%20in%201987.&text=But%20we%20need%20more%20people%20in%20skilled%20trades%2C%20particularly%20women

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Before continuing, it is important to first clarify that SETT refers to a broad range of knowledge, skills and qualifications/certifications achievable through various mechanisms and structures, as we will see. Closely related, and sometimes mistakenly used interchangeably, the phrase Science, Technology, Engineering and Math (STEM) also relates to a broad range of knowledge, skills and qualifications/certifications. Note, however, that STEM does not include the trades and consequently is described as a sub-set of SETT owing to its narrower scope. STEM is also often understood as relating more to university education and the skills/knowledge associated with STEM fields. Whereas by including the trades, SETT also refers to knowledge, experience and skills achievable through apprenticeships, colleges, polytechnics, institutes of technology, CEGEPs (collège d'enseignement général et professionnel) - specific to Quebec, university and other related programs. This distinction is particularly important when it comes to data-gathering and sharing. For instance, Colleges and Institutes Canada reported that while 34% of STEM degree-holders are women, they make up only 23% of Canadians working in science and technology positions.[4] Similarly, women held 12% of the apprenticeship registrations in Canada in 2023 (note that this includes female-dominated fields like early childhood education, hairstyling/esthetics, community/social services with 96%, 86% and 86% of registrations, respectively),[5] but make up just over 8% of skilled trades workers.[6]

This report analyses approaches to SETT education across Canada's federal, provincial and territorial jurisdictions between 2015 and 2025, focusing primarily on the period since 2020. The aim of this work is to:

- provide information and insights with respect to SETT education structures in Canada.
- analyse different approaches to SETT education.
- identify structural barriers to SETT education, generally, as well as structural barriers that may be gender-based/intersectional in nature.
- make recommendations to help eliminate structural barriers to SETT education.

Noting that SETT is an expansive area of educational programming and that related work has been undertaken with engineering education and qualification across Canadian jurisdictions, this research focused on SETT generally and trades and technology education more specifically. Consequently, comments regarding science and

[4] Cited in Colleges and Institutes Canada, "By the Numbers: Exploring Women's Presence in Canadian Colleges and Institutes."
[5] "Table 37-10-0219-02, Number and percentage of apprenticeship program registrations by age group, major trade group, sex and registration status," Statistics Canada, release date 2024-12-11, modified 2025-07-12, https://doi.org/10.25318/3710021901-eng.
[6] Cited in Cadloff, "With Demand for Skilled Trades Soaring, More Women Join the Ranks."

engineering will be more general in nature. This work marks an initial contribution to understanding current SETT coordination/integration and related structural barriers in Canada. Additional research is necessary to build on this work, filling in any gaps in the analysis, including strengthening analysis of integration across each of the four SETT streams and Canadian educational jurisdictions.

Methodology

This report is based on web-based research conducted during June of 2025. After a review of the division of powers within Canadian federalism in relation to SETT education, data was gathered from each jurisdiction – federal, provincial and territorial, with respect to legislative frameworks, ministerial and departmental structures, provincial elementary and secondary curriculum and related pathways or transitional supports, such as trades certification bodies, in relation to post-secondary education. More specifically, this involved analysing:

a) elections and/or legislative assemblies between 2015 and 2025 to map changes in government.
b) current and past cabinet positions/ministries and mandate letters to map responsibility for SETT education.
c) the legislative responsibilities of the SETT-relevant ministries.
d) Information drawn from the ministry/departmental websites and related government policy documents.
e) elementary and secondary curriculum overviews in SETT-related subjects.
f) Identifying and analysing governmental agencies responsible for administering SETT-related fields, such as Skilled Trades BC or Manitoba Trades.

In addition to the above, information from the Council of Ministers of Education Canada and Engineers Canada was analysed for SETT-relevant policy, guidance and coordination.

Evaluating structural barriers to SETT education in Canada in terms of a rating scale is both challenging and problematic given the diversity within SETT streams, educational jurisdictions – from federal/provincial/territorial to regional school boards, schools and even classrooms. Such is the localized nature of education in Canada and, indeed, in many countries. Ultimately, however, data regarding participation in SETT education provides an indication of the current situation, progress made and the length of the road to gender parity in SETT education. With a view to achieving a way of gauging the current status of participation in SETT education by gender, I propose the SETT Post-Secondary Education Participation Score. Table 1, Statistical Analysis of Women in Post-Secondary SETT Education, provides a score for women in each jurisdiction by averaging:

- the percentage of female apprenticeship registrations;
- the percentage of women enrolled in post-secondary STEM programs; and,
- the percentage of women graduates from post-secondary STEM programs.

This table is based on the most recent data available for each variable and, importantly, falls during the COVID-19 pandemic. Note that the information is based variably on sex and gender and looks, in this example, only at the participation of females/women. As gender-based data improves, a more complete intersectional, gender-based analysis is strongly recommended. Also, information for the territories is incomplete. Consequently, a participation score is not provided but all available territorial data is included in the table, with some information relating to each individual territory and some relating to all three territories. While readers may be tempted to calculate the territorial participation rate, the limited sample size serves as ample caution to avoid this. Future work on the participation score might include an analysis of change over time, further disaggregation across the SETT streams and comparison/tracking with related labour force participation data.

Canadian Federalism

Canadian federalism itself poses a structural barrier to SETT education. This is evident more so in terms of a strategic, coherent, consistent, aligned approach to SETT education policies and frameworks and has the potential effect of compromising access to SETT education. To explain, Canada is a nation of 14 legislative jurisdictions comprised of one federal, ten provincial and three territorial governments. Further, among the provinces, Quebec holds status as a society distinct from the rest of English Canada, with its system of CEGEPs serving as one example of Quebec's unique approach to its social, political and cultural institutions.

Sections 91, 92 and 93 of Canada's Constitution Act (1867) set out the division of powers between Canada's federal and provincial governments. Section 93 gives provinces responsibility for education legislation, protecting denominational schools in existence at the time, and exempts Quebec from the latter protections.[7] Simultaneously, under the Canadian system the federal government is responsible for Indigenous peoples, immigration, the military, the census and statistics and for each of the three

[7] Constitution Act 1867, 30 and 31 Victoria, c.3 (U.K.), VI. Distribution of Legislative Powers, section 93, https://laws-lois.justice.gc.ca/eng/const/page-3.html#h-23.

territories, to which it has delegated responsibilities in law, including education.[8] These responsibilities mean that the federal government is also involved in education.

In Canada, consequently there are 14 governments making legislation, setting policy and budgetary frameworks with respect to education. Fairly unique among nations, Canada does not have a national approach to education, let alone to SETT. This impacts the governance, implementation, monitoring/evaluation of education broadly as well as efforts to gather/use education data. In a similar way each of the four streams of SETT are also impacted.

Canada

Through its powers the federal government offers SETT-focused supports. For example, Statistics Canada provides SETT data that can complement provincial statistics as well as support the efforts of local and regional workforce development boards. With colleges, CEGEPs and universities able to access research monies and scholarships through the three federal granting councils,[9] SETT-focused students and researchers can advance their research, education and skills. Other examples of supports, available through Employment and Social Development Canada (ESDC), include; the Canada Student Loans/Grants program, multi-year federal-provincial workforce development agreements (2016-2023) offering training and upskilling monies, wage subsidies for internships - these last two are particularly for groups marginal to the workforce, the Canadian Apprenticeship Strategy – offering funding supports to skilled trades workers, the Canadian Apprenticeship Campaign and the Canadian Student Loans/Grants program. Importantly, ESDC also supports the Red Seal Program through the Canadian Council of Directors of Apprenticeships, a forum for federal-provincial-territorial collaboration on trades and apprenticeships.[10]

The Red Seal program establishes common standards based on which the skills of tradespeople are assessed across jurisdictions.[11] In addition to serving as a symbol of an individual's skill or knowledge of a trade, the Red Seal facilitates labour mobility for people in their chosen trade. Through the Red Seal program, a chart, known as the Ellis Chart, is maintained providing comparative apprenticeship and certification information

[8] Constitution Act 1867, section 91. Delegation of responsibilities to the territories for education is set out in the Yukon Act, the Nunavut Act and the Northwest Territories Act, as opposed to the Constitution Act, making these delegated powers revocable.
[9] The Natural Sciences Engineering and Research Council (NSERC), the Canadian Institutes for Health Research (CIHR) and the Social Sciences and Humanities Research Council (SSHRC).
[10] "Canadian Council of Directors of Apprenticeships," Red Seal Program, last modified 2018-02-22, https://www.red-seal.ca/eng/about/ccda.shtml.
[11] "Red Seal Program," Red Seal Program, last modified 2024-12-05, https://www.red-seal.ca/eng/about/program.shtml.

on trades in Canada, whether a Red Seal trade or not.[12] While the Red Seal and Ellis Chart information seem to be maintained and current, the design of the site itself is outdated and lacks freshness, failing to inspire confidence in the information provided and related accessibility features as well as making it difficult to navigate. Indeed, the federal Red Seal and Ellis Chart sites are seldom linked with related provincial/ jurisdictional information or related websites.

In addition to the federal government, a few key organisations also help to bring cohesion to SETT educational frameworks. These include Engineers Canada and the Council of Ministers of Education Canada. I will discuss each of these next.

The Council of Ministers of Education, Canada (CMEC)

To support coordination across Canada's educational jurisdictions, CMEC plays a centralizing role enabling ministries and departments of education to "collaborate on activities, projects and initiatives of interest to all provinces and territories."[13] Over its nearly 60 years, CMEC has engaged provincial and territorial ministries of education in dialogue around SETT-related topics and more generally, ensuring that training and skills development correspond to current and future labour market needs. For example, as recently as 2024, Skills Canada shared insights on trends in the skilled trades with ministers emphasizing their lead role regarding meeting labour market needs. In spite of its Strategic Plan emphasizing accessibility for all through emphases on inequity and inclusion, Indigenous education and mental health and well-being; its Indigenous Education Plan, 2023-27; and its Post-Secondary Education Strategy 2023-27, CMEC plays more of a facilitative role rather than directly addressing structural barriers in education, no less in SETT. In this respect, CMEC has an opportunity to play a greater role in highlighting structural barriers that may be at play through both its international-facing work and its inter-jurisdictional relationships. For example, its work with the Pan-Canadian Assessment Program and related international data-gathering efforts,[14] can help to identify and address structural barriers in SETT. Discussions held during its June 2025 meeting suggest this may be an opportune time to strengthen CMEC's orientation to pressing SETT matters in that:

> For the next year, ministers agreed to work together to review their priorities as part of this important intergovernmental forum by refocusing its mandate to more

[12] "About the Ellis Chart," Ellis Chart, last modified 2024-10-29, https://www.ellischart.ca/eng/about/.2ll.3s.shtml.
[13] "What is CMEC?" Council of Ministers of Education, Canada, accessed June 2025, https://cmec.ca/11/About_Us.html.
[14] Such as the OECD's (Organisation for Economic Co-operation and Development) Program for International Student Assessment (PISA), Trends in International Mathematics and Science Study (TIMSS), Progress in International Reading Literacy Study (PIRLS).

effectively support ministers in their discussions on common challenges in education.[15]

An important first step would involve reviewing and revising the key priorities and action areas of the country's education ministers. As well, the 1997 Common Framework of Science Learning Outcomes, K to 12,[16] should be renewed to reflect current thinking on scientific literacy in Canada, updated learning outcomes and pedagogical approaches that value diversity, are inclusive and advance equity in the sciences. This will necessarily catalyse dialogue regarding common challenges, unique strengths and future pathways for quality, accountability, mobility and accessibility within and across Canada's education jurisdictions.[17]

Engineers Canada

Engineers Canada is a membership-based organization that accredits undergraduate engineering programs, supports relationships among each of the provincial engineering regulators and facilitates labour mobility within the engineering profession.[18] There are 307 accredited engineering programs located at 45 of Canada's higher education institutions.[19] On successfully completing one of these programs, graduates can initiate the process of becoming a licensed professional engineer in Canada through one of the 12 provincial/territorial engineering regulators. Again, owing to a division of powers in Canada, the requirements for becoming an engineer vary by jurisdictional regulator. Having said that, licensure involves meeting five criteria; acquiring recognized academic qualification, completing required work experience, completing a professional practice examination, demonstrating good character and the capacity to work in either English or French.[20] Whether certified to work in another province/territory or another country, an engineer wishing to move to another province/territory in Canada must apply to that new jurisdiction to be licensed to practice as an engineer.

Engineers Canada has a multi-pronged approach to equity, diversity and inclusion, more generally (including focus on youth, reconciliation and newcomers) and for women

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[15] "Provincial and Territorial Ministers of Education Discuss Shared Priorities at 113th CMEC Meeting," Council of Ministers of Education, Canada, last modified 2025-06-26, https://cmec.ca/278/Provincial_and_Territorial_Ministers_of_Education_Discuss_Shared_Priorities_at_113_sup_th__sup__CMEC_Meeting.html?id=1062.

[16] See the Framework at https://science.cmec.ca/framework/Pages/english/1.html.

[17] Council of Ministers of Education, Canada, "Victoria Declaration 1993," (Toronto: CMEC, 1993), 2, https://www.cmec.ca/Publications/Lists/Publications/Attachments/251/victoria-declaration-1993.pdf.

[18] "About Engineers Canada," About, Engineers Canada, accessed June 2025, https://engineerscanada.ca/about/about-engineers-canada.

[19] "About Accreditation," Accreditation, Engineers Canada, accessed June 2025, https://engineerscanada.ca/accreditation/about-accreditation.

[20] "Overview of the Licensing Process," Become an Engineer, Engineers Canada, accessed June 2025, https://engineerscanada.ca/become-an-engineer/overview-of-licensing-process.

in engineering, in particular. Its strategy for diversity "is driven by strong partnerships."[21] As part of its focus on the inclusion of women through recruitment and retention and recognizing intersectional identities,[22] Engineers Canada should turn its attention to identifying and addressing structural and systemic gender-based barriers in accessing, engaging with and contributing to the profession.

Provincial/Territorial Education

If SETT across Canada is best characterized as a many-splendoured thing, then education across the provincial/territorial jurisdictions is best described as a localized venture that seeks to serve diverse constituencies. The result, however, is a confusing and complex array of educational structures and legislative frameworks, organisms, programs and curricula. For the most part, education across Canadian jurisdictions functions under two government ministers and corresponding departments; one for early years, elementary and secondary education and the second for post-secondary education. In smaller jurisdictions, education is coordinated under one minister as in, for example, Newfoundland and the territories. In virtually all examples, ministers with responsibility for education enjoy collaborative responsibilities or relate closely with ministers responsible for areas like immigration, labour/employment/skills and, in the example of British Columbia (BC), social development and poverty reduction. Across their respective departments, ministers responsible for education are responsible for administering a broad cross-section of legislation.[23] To ease the burdens of resourcing education, some jurisdictions enter into agreements, as in the territories, where the elementary/secondary school curriculum of other provinces is used or adapted.[24]

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[21] "About Diversity in Engineering," Equity, Diversity and Inclusion, Engineers Canada, accessed June 2025, https://engineerscanada.ca/diversity/about-diversity-in-engineering.

[22] "Realizing Tomorrows: Engineers Canada 2025-2029 Strategic Plan," Engineers Canada, accessed June 2025, https://engineerscanada.ca/about/governance/realizing-tomorrows.

[23] For example, at least 13 laws in Newfoundland's ministry and approximately 27 laws across Nova Scotia's two ministries. See "Legislation," About the Department, Education and Early Childhood Development, Government of Newfoundland and Labrador, accessed June 2025, https://www.gov.nl.ca/education/department/legislation/. "Department of Advanced Education: Legislation," Government of Nova Scotia, accessed June 2025, https://beta.novascotia.ca/government/advanced-education/legislation. "Department of Education and Early Childhood Development: Legislation," Government of Nova Scotia, accessed June 2025, https://beta.novascotia.ca/government/education-and-early-childhood-development/legislation.

[24] Yukon, NWT are currently using/adapting BC's curriculum and Nunavut is transitioning to its own curriculum through to 2036 from Alberta. "Teachers Learning New Curriculum to be rolled out in Nunavut starting next year," North, News, CBC, accessed July 2025, https://www.cbc.ca/news/canada/north/new-inuktut-curriculum-nunavut-1.7490070. "Learn About Curriculum Changes," Kindergarten to Grade 12 Curriculum, Education and Schools, Yukon Territory Government, accessed June 2025, https://yukon.ca/en/curriculum-changes. "JK-12 Curriculum Renewal," Education, Culture and Employment, Government of Northwest Territories, accessed June 2025, https://www.ece.gov.nt.ca/en/curriculumrenewal.

Elementary and Secondary Education

Ministries responsible for elementary and secondary education across the provinces are tasked with administering to the needs of diverse constituencies, within their respective jurisdictions, resulting in different education systems. For example, in Nova Scotia the provincial government oversees public, private and homeschooling, meeting the needs of religious (e.g. Catholic) and linguistic groups (e.g. English, French, Acadien) within its public system. By comparison, Ontario has four school systems – English public and Catholic, French public and Catholic. In addition, within any of these systems, the needs of mature or returning students, students with disabilities and/or newcomers are met while integrating diverse perspectives and worldviews. Returning to the example of Nova Scotia, this involves Mi'kmaw Ways of Being and Knowing, Inclusive Education approaches and the African Nova Scotian Education Framework. Drawing on this example, it is important to interrogate to what extent SETT is available across these systems and indeed, the quality of SETT when it is available within these different systems.[25] This does not in any way diminish the importance of equitable approaches to SETT, rather it highlights the challenges of resourcing, coordinating and building capacity for equity in SETT education, given the diversity within and across the jurisdictions and, simultaneously, the homogeneity within SETT areas of study. Ministerial leadership can help to offset the challenges of balancing and resourcing these diverse needs. For example, in Manitoba the minister of Education and Early Childhood Learning was tasked with augmenting STEM programming in secondary schools and improving math in the K-12 curriculum.[26] Similarly, Manitoba's Minister of Advanced Education and Training was mandated to provide complementary, equitable support to STEM pathways to training and employment, and support job-readiness and the economic needs of the province through their work with colleges/technology institute.[27]

School systems are generally administered by school boards[28] overseen by locally-elected boards of trustees working in compliance with jurisdictional legislation and in coordination with ministry requirements/guidance. Alberta's Assurance Framework

[25] Similarly, SETT availability and quality must be interrogated across those areas, discussed earlier, for which the federal government holds responsibility.
[26] Wab Kinew, Premier of Manitoba, Letter to Minister Altomare, October 19, 2023, https://www.gov.mb.ca/asset_library/en/proactive/20232024/education-and-early-childhood-mandate-letter.pdf, 2.
[27] Wab Kinew, Premier of Manitoba, Letter to Minister Cable, October 19, 2023, https://www.gov.mb.ca/asset_library/en/proactive/20232024/advanced-education-and-training-mandate-letter.pdf, 1-2.
[28] Sometimes called school divisions or districts.

supports school board monitoring and accountability and serves to illustrate how school boards function, juggling the priorities of many masters:

> School authorities get equitable funding and have flexibility to use their resources to meet students' learning needs. In return, school authorities are responsible for providing assurance to their local stakeholders, Alberta Education and the public that they are fulfilling their responsibilities and students are successful.[29]

The problem however is that annual plans, performance measures and results reports are general in nature. While education planning cycles, as in Alberta, may be one avenue for addressing barriers to SETT, along with board elections, SETT priorities run the risk of being lost in the shuffle of other important educational priorities, rather than integrative. For example, school constituencies may be challenged to advance equity in education or advance SETT, instead of accommodating these complementary priorities. Similarly, under this system stakeholders and educators may have a bias for university-level programs, focusing their resources to the detriment of important trades and technology programming. This bias also comes into play when considering where students are encouraged to apply themselves, whether towards the workforce, the trades, college programs or university.

While governments may claim that school boards are funded equitably, it is not clear to what extent or in what ways the distribution of resources accounts for the costs associated with running SETT programs, including meeting the infrastructural needs of rural, remote areas or offsetting the individual needs of students when equipping themselves to enrol safely in such classes.[30]

Elementary/Secondary Curriculum

SETT learning is part of educational programming across different subjects and varies within each province/territory, school system, school board, and even classroom, in keeping with an individual educator's capacity. The curriculum, set by each provincial/territorial jurisdiction, establishes the educational objectives and learning outcomes for each subject and course, lending a baseline of consistency and coherence to classroom learning across each province/territory. SETT-related

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[29] "Assurance and Accountability in Alberta's k to 12 Education System," Part of Education Planning and Reporting, Alberta's K to 12 Education System, Government of Alberta, accessed June 2025, https://www.alberta.ca/accountability-education-system.

[30] Note that the costs of enrolling in SETT courses in post-secondary schools can also involve additional costs for tools and safety equipment. Helpfully, the Red Seal website includes a page linking to financial supports for trades apprentices, tax deduction information, employer tax credits and related financial provincial/territorial supports. "Financial Support," Red Seal Program, accessed June 2025, https://www.red-seal.ca/eng/financial/support.shtml.

curriculum is diverse across the provincial jurisdictions. Let us discuss each of the four SETT streams in turn.

Offerings in math/science increasingly commence as early as kindergarten, with a predetermined number of required math or science courses at the secondary level, ensuring that students are exposed to these subjects into the early secondary years. Notably in Nunavut, revisions to the curriculum include infusing Indigenous approaches, bringing 'two-eyed seeing' to the science curriculum as well as land-based learning as early as kindergarten and grade one.[31] Alberta's science curriculum revisions also included reference to more diverse perspectives, including Indigenous perspective. Only a few jurisdictions offer engineering courses:[32] Ontario, PEI, Newfoundland and BC, as part of their redesigned curriculum.

Increasingly, jurisdictions are seeing and attempting to respond to the need for learning in technology with some exposing students to related concepts and competency in the early grades. For example, Manitoba's Information and Communications Technology curriculum runs from kindergarten to grade 12 and Technology is part of the grade 6, 7, 8 curriculum. Having said this, it seems that this is the first opportunity students have for hands-on learning outside of art and music. Topics included under the technology umbrella are also quite variable and sometimes mesh or overlap with trades across the jurisdictions. As discussed earlier, in some jurisdictions this section of the curriculum is quite limited. For example, in PEI, the Career and Technical Education Curriculum includes automotive, carpentry, robotics, technical education, life skills-food and welding sections.[33] By comparison, Manitoba's Technology Education Curriculum includes courses in vocational industrial, industrial arts, human ecology/home economics and business and marketing education.[34] In Ontario, Technological Education is more comprehensive at the secondary level. It includes 46 course offerings across various areas such as green industry, health, aesthetics, child development, woodworking and transportation technology, in addition to the engineering courses mentioned earlier.[35] This in no way means that each secondary school or indeed each school board or even

[31] Nunavut Department of Education, *Nunavut Kindergarten-Grade 6 Curriculum Orientation Guide*. (Iqualuit: Government of Nunavut, 2023), 4.12, 6.8, https://www.gov.nu.ca/sites/default/files/publications/2025-04/Curriculum_Orientation_Guide_02.pdf.
[32] Ontario has computer, construction and manufacturing engineering technology, see https://www.dcp.edu.gov.on.ca/en/curriculum/technological-education/courses-list. Newfoundland offers Robotic Systems Technology, see https://www.gov.nl.ca/education/k12/curriculum/guides/teched/.
[33]See PEI Career and Technical Education Curriculum, https://www.princeedwardisland.ca/en/information/education-and-early-years/career-and-technical-education-curriculum.
[34] "Technology Education, Welcome!" Education and Early Childhood Learning, Government of Manitoba, accessed June 2025, https://www.edu.gov.mb.ca/k12/cur/teched/index.html.
[35] See Ontario https://www.dcp.edu.gov.on.ca/en/curriculum/technological-education/courses-list.

school system in Ontario offers each of these 46 courses, it merely means that the province has corresponding curriculum which can be offered.

We see similar dynamics when analysing trades curriculum; crossover or complementarity with technological education and diversity in terms of both the number of trades courses offered and the content that is covered. This may relate to budgetary and staffing considerations, stakeholder input, designated trades within each province and/or labour market demand, whether local, regional, provincial or national. For example, Newfoundland's Skilled Trades curriculum consists of two introductory courses (Skilled Trades and Health and Safey) and four additional courses relating to three trades.[36] Nova Scotia's Trades program is simultaneously limited and general with six broad trades courses offered (e.g. service trades, manufacturing trades, transportation trades) in addition to cooperative education. Some of the technology courses on offer, such as Construction Technology or Electrotechnologies, may complement the provinces trades offerings while at the same time covering a range of areas. [37]

Finally, many jurisdictions offer educators guidance on integrating diverse perspectives or infusing equity into curriculum and/or teaching practise. PEI's Science Foundation is the result of the combined efforts of the Foundation for the Atlantic Canada Science Curriculum, involving representatives from each provincial department of education. It serves as "a framework to support teachers in the implementation of science curriculum"[38] and includes guidance on gender equity, in addition to science programs for exceptional students as well as for a multicultural society.[39] The problem is that the document dates to the late nineties and, while it may have been revised, it does not reflect or integrate current thinking on equity, diversity, inclusion, intersectionality or gender diversity.

While such resources and even encouragement exists, there are few mechanisms for keeping them current. Developing related capacity among SETT educators and/or requiring that learning inequities be addressed in classroom practise requires leadership commitment – including and particularly on the part of elected officials, capacity

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[36] To see Newfoundland's skilled trades curriculum, go to: https://www.gov.nl.ca/education/k12/curriculum/guides/skilledtrades/.

[37] To see Nova Scotia's course offerings and structure, go to: https://curriculum.novascotia.ca/english-programs/high-school/full-course-list.

[38] "Foundation for the Atlantic Canada Science Curriculum" Publications, Government of PEI, published May 19, 2016, https://www.princeedwardisland.ca/en/publication/foundation-for-the-atlantic-canada-science-curriculum.

[39] PEI, NB, Newfoundland and Nova Scotia Departments of Education, *Foundation for the Atlantic Canada Science Curriculum, Science Foundation, 1998*. https://www.princeedwardisland.ca/sites/default/files/publications/eelc_science_foundation_document.pdf.

development through access to sustained, current professional development (both voluntary and required) and meaningful integration into regular performance review processes.

Programming for SETT

Program structures and supports for SETT are perhaps just as important as the curriculum on offer, if not more so. Drawing largely from the examples of Alberta, Ontario and Quebec we can see how program structures can support learners to advance in different SETT fields. While there are many ways that program structures can work, we'll discuss CEGEP/polytechnic learning, work experience and inter-institutional collaboration.

In Quebec and some education jurisdictions in the rest of Canada, educational programming is offered via a CEGEP and/or a polytechnic. The former is unique to Quebec. Secondary school ends in grade 11 (as opposed to grade 12 in other jurisdictions) at which time students make work and career-focused decisions that might see them go directly into the workforce, pursue trades training, technical education or university. CEGEPs offer 2- or 3-year diplomas based on these last two options. A two-year diploma is a pre-requisite for university study and a three-year diploma prepares students for work in more technical fields (as do colleges in the rest of Canada). Trades training is available through vocational training centres in the province, as opposed to colleges and private providers in the rest of Canada, culminating in a Diploma of Vocational Studies.[40] The beauty of CEGEP study is that it places students interested in technical and university learning together, enabling them to prepare for and be exposed to different learning paths. In a related way, polytechnical education can support SETT. A polytechnic is:

> an institution of higher education providing technical, applied, hands-on learning; offering applied degrees, diplomas, certificates and apprenticeship training; fuelling business innovation with applied research expertise.[41]

Arguably, polytechnical education is enjoying a bit of a resurgence. Thirteen institutions across Canada are (re)certifying and a handful of technical institutes are focused on Indigenous education, from which much could be learned. In addition, provincial ministries of education are applying methods that emerged from the tradition of secondary and post-secondary polytechnical programming.

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[40] "Studying in Vocational Training," Gagne Ta Vie avec La Formation Professionnelle, Government of Québec, last updated June 4, 2025, https://www.quebec.ca/en/education/vocational-training-adult-education/vocational-training/studying-vocational-training#c114702.

[41] "POL•Y•TECH NIC / päle' teknik /," Polytechnics Canada, accessed June 2025, https://polytechnicscanada.ca.

Alberta and Ontario have implemented a handful of effective practices that support SETT, particularly with respect to the trades and technology. Where it has streamed learning[42] at the secondary level for a number of years, the Ontario government has recently de-streamed its grade 9 courses in math and science, eliminating structural barriers to learning and improving flexibility in student learning pathways.[43]

Additional measures include making cooperative education more widely available and accessible, as a gateway to a host of educational programs, including apprenticeships for which cooperative education may apply as part of the Ontario Youth Apprenticeship Program.[44] Also, through the Specialist High Skills Major Program learning is focused in a specific economic sector (e.g. agriculture, mining, business, sports). Student study, cooperative education and related certifications such as first aid, familiarize students with a sector while offering helpful experience and knowledge oriented to future employment in that area.[45] Finally, dual credit programs enable students to take courses that count towards both their secondary school diploma and their chosen post-secondary degree/diploma/certificate. In Alberta, the Registered Apprenticeship Program offers similar dual credit recognition. Significantly, these programs provide secondary school students with valuable experience in post-secondary education – preparing them for success, while also offering secondary and post-secondary educators the opportunity to exchange information and insights about SETT.

Post-Secondary Education Programs

Science

Quality assurance with respect to post-secondary education programs are important checks for the science streams in SETT. In Ontario, for example, the Ontario Qualifications Framework sets out the requirements for "all non-religious post-secondary certificate, diploma and degree programs offered under the auspices of the Province…including apprenticeship certificates, the qualifications awarded by public

[42] Placing students in courses classified according to their aspirations in courses designated as open, university/college preparation, university preparation, college preparation or workplace preparation.
[43] "Ontario to End Academic Streaming for Grade 9 Students Starting Next School Year," Toronto, News, CBC , last updated November 11, 2021, https://www.cbc.ca/news/canada/toronto/ontario-schools-streaming-academic-applied-1.6245612.
[44] "Ontario Youth Apprenticeship Program, " Education and Training, Ministry of Labour, Immigration, Training and Skills Development, Government of Ontario, last updated April 2, 2025, https://www.ontario.ca/page/ontario-youth-apprenticeship-program.
[45] "Specialist High Skills Major (SHSM)," Education and Training, Kindergarten to Grade 12, Ministry of Education, Government of Ontario, last updated July 10, 2025, https://www.ontario.ca/page/specialist-high-skills-major.

colleges, and degrees offered by [authorized] public universities."[46] Organizations like the Ontario College Quality Assurance Service and the Ontario Universities Council on Quality Assurance, each established by their respective constituencies – the Colleges of Applied Arts and Technology in Ontario and the Council of Ontario Universities - oversee quality assurance processes, including alignment with provincial legislation, policy and frameworks.[47]

Apprenticeships

Within the many-splendouredness of SETT, trades certification in Canada is its own veritable patchwork quilt of options.[48] Under their respective provincial and territorial apprenticeship acts, each jurisdiction identifies the trades it will regulate. Known as designated trades, each province or territory sets out how these identified trades are administered, including setting the standards for training.[49] This means that the registration, curriculum, accreditation and certification requirements are more closely regulated than other trades and that a trade may be designated in one jurisdiction and not another or it may be designated across two or more jurisdictions but have different requirements across each province or territory. Designation also relates to involvement in the Red Seal program, determined both by provincial/territorial jurisdictions and the Canadian Council of Directors of Apprenticeship.[50] To further illustrate this complexity, some trades involve voluntary or non-compulsory certification, meaning that certification is available, but legislation does not require individuals to be registered or certified to practice the trade.[51] This variation across jurisdictions is a structural barrier to trades certification[52] as is accessing related information including:

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[46] "Ontario Qualifications Framework," Postsecondary Education, Education and Training, Ministry of Colleges, Universities, Research Excellence and Security, Government of Ontario, last updated January 26, 2024, https://www.ontario.ca/page/ontario-qualifications-framework#aboutoqf. For a pdf version of the Framework, go to https://www.ocqas.org/wp-content/uploads/2022/12/oqf.pdf.

[47] "OCQAS Background," Ontario College Quality Assurance Service, accessed June 2025, https://www.ocqas.org/about/ocqas-background/.
"Welcome to the Quality Council," Ontario Universities Council on Quality Assurance, accessed June 2025, https://oucqa.ca.

[48] See for example, "Glossary of Terms for Apprenticeship Training and Trades Certification," Ellis Chart, date modified 2024-07-16, https://www.ellischart.ca/eng/gl.4ss.1ry.shtml.

[49] "Red Seal Trades," Red Seal, modified 2025-05-06, https://www.red-seal.ca/eng/trades/trades-list.shtml.

[50] "Glossary of Terms for Apprenticeship Training and Trades Certification," Ellis Chart, modified 2024-07-16, https://www.ellischart.ca/eng/gl.4ss.1ry.shtml.

[51] Ellis Chart, "Glossary of Terms for Apprenticeship Training and Trades Certification." Provinces and Territories designate each trade as compulsory or voluntary. Work in compulsory trades can only be performed by certified journeypersons or registered apprentices. Work in voluntary trades may legally be performed with or without certification or apprenticeship training.

[52] For information about trades mobility/work across jurisdictions, see the Provincial-Territorial Apprentice Mobility Guidelines and the Provincial-Territorial Apprentice Mobility Transfer Guide available at https://www.gov.nu.ca/en/employment-training-and-career-development/apprenticeship-trade-and-occupations-certification.

- what is a designated trade?
- which trade(s) are designated in any one jurisdiction?
- what are the requirements related to achieving a specific designated trade in any one (or more) jurisdiction(s)?
- is certification voluntary/non-compulsory? If so what are the advantages of formal training?
- is there a corresponding Red Seal program for a specific trade?
- what are the requirements related to Red Seal certification for any one trade?
- is pursuing Red Seal certification worthwhile (given specific career goals)?

The Ellis Chart, mentioned earlier, can assist with this information. Having said that, users must trust that it is kept up to date and work through its poor design.

Most provinces have also delegated responsibility for the trades to a unique body[53] that provides oversight and support regarding trades designations, qualifications, certifications, apprenticeships and often promotion. Note that each agency has a unique mandate and is linked or responsible to different government ministries, such as ministries responsible for workforce development/labour, family services or post-secondary education. These organisms may be a division of a governmental department, as in PEI, or an independent body, as in BC. They may assist with finding an employer with which to apprentice or this may be coordinated elsewhere or not at all, leaving it to individuals to make their own arrangements. To help address this problem, five provinces have created an apprenticeship management system supporting employers, apprentices and staff supports.[54] Importantly, these agencies can also play a role in addressing structural barriers to the trades. For example, Skilled Trades BC offers training programs for underrepresented groups and TradeUpBC coordinates efforts among BC's post-secondary institutes by offering microcredentials and professional development to tradespeople and employers, supporting enhanced career pathways.

Where are educators in this patchwork quilt? Post-secondary organizations offering trades education train to the established certification criteria, resulting in a diploma/certificate and/or linking to related components of an apprenticeship qualification. At the same time some certification(s) are subject to third-party testing

[53] Skilled Trades BC, Alberta Board of Skilled Trades, Saskatchewan Apprenticeship and Trade Certification Commission, Apprenticeship Manitoba, Skilled Trades Ontario, SkillsPEI, Skilled Trades New Brunswick, Nova Scotia Apprenticeship Agency, TradesNL.

[54] Nova Scotia Apprenticeship Agency, "Apprenticeship Management System – a Tool for Success," https://www.nsapprenticeship.ca/sites/default/files/files/benefits-ams.pdf.

bodies, to support verification of student skill achievement.[55] Undoubtedly, there is more research to be done regarding the relationship between post-secondary education and trades/skill certification.

Conclusion

This report is based on web-based research focused on understanding the structural barriers to SETT in Canada focused on the years 2015-2025. It describes some of the legislated, jurisdictional, ministerial, curricular, programming and structural approaches to SETT education as well as makes recommendations both for improving SETT and for future research.

SETT is a many-splendoured thing. Each of its four streams is worthy of study in its own right. SETT education is an example of Canadian federalism at work. Each of our 14 legislative jurisdictions carry out their respective SETT educational responsibilities in keeping with existing systems and priorities. This means that SETT is more localized and subject to the resourcing, capacity and infrastructural strengths of distinct school systems, such as French Catholic education in Ontario, particular school boards – whether concentrated in metropolitan centres or spanning large rural, remote areas - and individual educator capacity.

As SETT students move through post-secondary systems, they encounter the challenges of inter-jurisdictional requirements in engineering and the quality assurance reviews necessary for science education. The patchwork quilt of trades and technology education is complex and difficult to access, perhaps not because of a lack of information but because there is so much and attempts to support cohesion across the different platforms is wanting. There is room here for the federal government to support coordination through a much-improved Red Seal portal and related information and statistics. While some provincial jurisdictions have built pathways for trades and technical learning that link secondary and post-secondary education, this is sadly missing in other jurisdictions. Much also remains to be done to coordinate, deepen and render more effective efforts to engage and retain diverse constituencies in these fields at all learning levels.

[55] The Canadian Welding Bureau for example, tests and certifies students enrolled Fleming College's welding program in Ontario. The Canadian Standards Association requires that "people performing welding on certain products, buildings, and bridge structures, and their miscellaneous components, must be qualified by the CWB and working for a certified company" in Canada. "Welder Qualification Testing," Canadian Welding Bureau, accessed June 2025, https://www.cwbgroup.org/services/certification/welder-qualification-testing.

Table 1: Statistical Analysis of Women in Post-Secondary SETT Education

Jurisdiction	Apprenticeship Registrations[56]	Postsecondary STEM Enrolments[57]	Post-Secondary STEM Graduation Rates[58]	SETT Post-Secondary Education Participation Score (Women)
	Percentage of female[59] apprenticeship registrations (2023)	*Percentage of women[59] students enrolled in STEM programs (2022/23)*	*Percentage of women[59] graduates from post-secondary STEM programs (2022)*	*Average of Female/Women Apprenticeship Registrations, Post-Secondary STEM Enrolments and Post-Secondary STEM Graduation Rates*
Total - Canada	12.2	38.9	38.1	29.7
Manitoba	15.4	43.4	41.1	33.3
Prince Edward Island	10.1	45.5	41.5	32.4
Nova Scotia	8.8	44.7	39.7	31.1
Ontario	13.1	39.4	38.7	30.4
Saskatchewan	11.3	39.6	39.1	30.0
British Columbia	11.3	38.0	39.4	29.6
Quebec	12.4	37.2	37.1	28.9
Alberta	11.9	38.0	35.7	28.5
Newfoundland	8.7	38.9	34.2	27.3
New Brunswick	7.0	36.1	33.9	25.7
Yukon	11.6	-	60	-
Northwest Territories	5.6	-	25	-
Nunavut	8.2	-	16	-
NWT, YK, NU	9.3	37.9	-	-

[56] "Table 37-10-0219-01 Apprenticeship programs by age groups, major trade groups, sex and registration status," https://doi.org/10.25318/3710021901-eng.
[57] "Table 37-10-0163-01 Postsecondary enrolments, by International Standard Classification of Education, institution type, Classification of Instructional Programs, STEM and BHASE groupings, status of student in Canada, age group and gender," Statistics Canada, release date 2024-11-20, modified 2025-07-13, https://doi.org/10.25318/3710016301-eng.
[58] "Table 37-10-0233-01 Postsecondary graduates, by International Standard Classification of Education, institution, and program and student characteristics," Statistics Canada, release date 2024-11-20, modified 2025-07-13, https://doi.org/10.25318/3710023301-eng.
[59] Note that information was available in terms of sex and gender across the data used from Statistics Canada.

Recommendations

The findings of this research suggest the following recommendations:

1. The federal government support trades and technology coordination by enhancing the Red Seal and Ellis Chart websites and expanding them to include links to governmental and non-governmental trades-supportive organizations with a view to serving as a national clearinghouse for trades-related education information.
2. The CMEC strengthen its mandate and capacity to support and coordinate education ministers in their efforts to address challenging education issues, including structural barriers to SETT learning, using timely, evidence and outcomes-based approaches, ideally culminating in an inter-jurisdictional strategic plan for gender equity in SETT.
3. The CMEC work with ministers of education to review and update the 1997 Common Framework of Science Learning Outcomes K to 12.
4. Engineers Canada challenge itself as an organization, its membership and its strategic partners to adopt systemic, structural approaches, including intersectional analysis, for identifying and addressing gender-based barriers to participation in all facets of the engineering profession.
5. The capacity of SETT educators be developed to ensure infusion of equity into teaching practise, by integrating criteria into ongoing performance development goal-setting, outcomes and review processes along with related professional development.
6. Evaluate the relative strengths/weakness and effective practices from Quebec's approach to vocational/CEGEP programs as well as those of polytechnical institutions and apply with a view to transforming existing approaches to SETT, perhaps even launching a polytechnic(s) that integrates gender-based design and analysis.
7. Elaborate on this initial research to deepen understanding of coordination across the four SETT streams and Canadian jurisdictions, treating each of the four streams of SETT in greater detail, focusing uniquely on each level of education.
8. Map and analyse federal, provincial and national non-profit organisms mandated to support and promote the trades, with a view to identifying and evaluating effective programs and practices centred on supporting women and diverse communities in the trades and advancing equity by addressing structural barriers.
9. Analyse the parameters around trades/technology education in post-secondary education (e.g. diploma/certificates) and credential recognition across the various trades bodies.
10. In addition to recommendation 7 above, conduct in-depth Canadian-based quantitative and qualitative analysis with respect to each of the four SETT streams to understand, account for and address gendered (and intersectional) barriers to

educational enrollment, completion, employment, retention and, ideally, active engagement (or contribution) to each SETT stream. This should be complemented by an analysis of effective models for addressing systemic and structural barriers to SETT both in Canada and abroad.

11. Evaluate the reliability/validity/utility of the Post-Secondary SETT Education Participation Score with a view to its potential for further disaggregation and for complementing it with a possible SETT labour participation score.

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