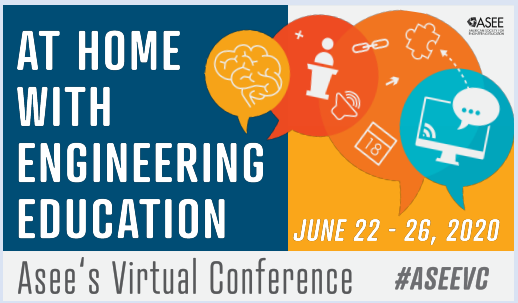

Supplement for ASEE LEAD Panel 2020

Panelists:
Tamara Etmannski, University of British Columbia
Darren Meister, Western University
Emily Moore, University of Toronto
Nate Quitoriano, McGill University
Marnie Jamieson, University of Alberta
Amy Hsiao, University of Prince Edward Island

Moderators:
Cindy Rottmann, University of Toronto
Meg Handley, Pennsylvania State University

We the North

Engineering Leadership Programs in Canada

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Table of Contents

Executive Summary

Introduction

The primary purpose of this supplement is to provide American Society for Engineering Education (ASEE)—LEAD division members with a feel for the Canadian engineering leadership (EL) landscape. A secondary purpose is to help us, as moderators, accurately and responsibly frame an ASEE2020 panel discussion highlighting a sub-set of these programs.

Canadian Context for Engineering Leadership Education

Engineering leadership programing in Canada is a relatively new phenomenon—with the earliest initiative introduced in 2002 [1-5]. As of 2020, we know of 15 programs[1] across the country. Similar to EL programs in the United States, most began with one or more champion(s) who recognized the socio-technical nature of engineering practice and set out to complement an exclusively technical curriculum with personal and professional development opportunities [6-9]. More often than not, the implementation phase involved a team effort with champions tapping into extensive university-industry networks [3-5, 10]. Comparable origin stories aside, the context for engineering education in Canada has a few unique features. First, while Canada is a signatory to the Washington Accord, engineering programs in Canada and the United States are evaluated by two different accreditation bodies—the Accreditation Board for Engineering and Technology (ABET) in the United States and the Canadian Engineering Accreditation Board (CEAB) in Canada. The CEAB requires Canadian engineering programs to demonstrate curricular attention to and assessment of undergraduate students along 12 dimensions called "Graduate Attributes": 1) engineering knowledge base, 2) problem analysis, 3) investigation, 4) design, 5) use of engineering tools, 6) individual and team work, 7) communication skills, 8) professionalism, 9) impact of engineering on society & environment, 10) ethics & equity, 11) economics & project management, and 12) lifelong learning [11, 12]. While leadership has not been explicitly named as a graduate attribute, the individuals we surveyed view eight of the twelve graduate attributes as strategic invitations to discuss leadership (GAs 4 & 6-12). Beyond the scaffolding offered by these graduate attributes, EL program directors and champions in Canada draw support from two networks enabling them to connect, share experiences, and learn from one another—1) the National Initiative on Capacity Building and Knowledge Creation for Engineering Leadership (NICKEL) and 2) an emerging Special Interest Group of the Canadian Engineering Education Association (CEEA/ACEG) highlighting the intersection of leadership, management and sustainability (SELM). NICKEL was established in 2016 by Professor Doug Reeve and Mike Klassen (University of Toronto), and is currently led by Professor Patricia Sheridan and Milan Maljkovic (University of Toronto). SELM was established this year by Professor Marnie Jamieson (University of Alberta) and Professor John Donald (University of Guelph). Loose parallels exist between NICKEL and COMPLETE (Community of Practice on Leadership Education for the Twenty first century Engineer), as well as between ASEE-LEAD and CEEA/ACEG-SELM. The first pair function as communities of practice for engineering leadership program leaders, while the latter pair connect EL educators engaged in research and program evaluation through national engineering education associations.

Methods

We generated individual program profiles and cross-program comparisons by surveying 11 Canadian engineering leadership educators—mostly program directors. Our sampling strategy involved reaching out to the NICKEL community. We sent the survey to program directors located in 15 universities and received 11 completed surveys by January 31st, 2020. Participants were invited to respond to the following prompts: background information, vision, mission, origin stories, program goals, program elements, target audience,

[1] Canadian engineering leadership initiatives range in size from a single course or co-curricular opportunity to a well-staffed institution. We use the term "program" to include the full range of initiatives.

student access, degree of institutionalization, intended learning outcomes, conception of leadership, instructional strategies and website information. All 11 survey respondents consented to have their institutional profiles available to ASEE LEAD division members. The individual profiles feature participants' verbatim responses to survey questions.

Key Findings

Engineering Leadership development in Canada is supported through three program types—1) leadership development institutes or centres, 2) core engineering design courses as a vehicle for leadership development, and 3) EL degree granting programs. These programs are typically driven by faculty sponsors, industry donors, and centralized accreditation efforts. To the best of our knowledge, there are only three degree granting engineering leadership programs in the country (UBC, UPEI and Ryerson), but a growing number of institutes have begun to offer certificate and diploma programs. Our descriptive analysis of survey data is broken into three key sections: origin stories, institutional structure and student programing. Key findings for each section are summarized below:

1) **Origin Stories: How, when and why did EL programs begin in Canada?**
    a. **Start date:** range from 2002-2019—with nine of the 11 formalized in 2014 or later
    b. **Origin story:** University champion (55%), accreditation (36%), industry endowment (27%), untapped market (9%)
    c. **Vision**: Student development (100%), social impact (64%), innovation/entrepreneurship (55%)

2) **Institutional Structure: What are the central features of Canadian EL programs?**
    a. **Program types**: leadership institutes (4), curricular integration of leadership into core design courses (3), degree programs (2), stand-alone courses/co-curricular offerings (2)
    b. **Delivery mechanisms**: courses (82%), course integration (66%), co-curricular programs (66%), outreach (54%), research (45%)
    c. **Target audience:** undergraduate students (82%), graduate students (73%), industry (55%), alumni (36%)
    d. **Student access**: open enrollment with registration (73%), by application (55%), drop-in (9%)
    e. **Degree of Institutionalization**: universal/required for graduation (55%), elective—for credit/CCR (55%), elective—no formal recognition (9%)

3) **Student Programing: What is the purpose of EL education and how does it unfold?**
    a. **Program goals**: professional development (91%), personal development (82%), social impact (73%), fostering industry relationships (73%)
    b. **Learning objectives**: teamwork (91%), social impact (82%), learning about oneself (73%), navigating organizational contexts (64%)
    c. **Conception of leadership**: process (55%), process & position (45%)
    d. **Pedagogy**: experiential/active learning (91%), theory/frameworks (64%)

Conclusions

While there is no typical Canadian engineering leadership program, there are some regional trends. Many of the EL programs in "central[2]" Canada foreground the personal development of engineering leaders through a suite of co-curricular and elective course offerings, while programs in the Prairie and (perhaps) Maritime provinces favour an accreditation-driven engineering design approach with compulsory leadership learning opportunities integrated into the core curriculum. Compared to EL programs in the United States examined by Graham, Klassen, Paul [4, 5, 10, 13], the Canadian programs we highlight in this report are slightly less institutionally

[2] "Central Canada" is a geographical misnomer used to identify two east of centre provinces—Ontario and Quebec.

bounded[3]. Rather, they tend to favour universal access to the full cohort of undergraduate engineering students. This laudable accessibility goal has implications for program evaluation and evidence-based program improvement since it is very difficult for Directors, staff and even students themselves to identify who is an engineering leadership student. While both Canadian and US-based EL programs address social impact, Canadian programs are somewhat less likely than their US counterparts to mandate course-embedded global learning experiences. Rather—consistent with a universal access approach, they frame social and environmental impact considerations as a professional responsibility for all engineering graduates. EL programs on both sides of the border blend socio-technical competencies, place high value on teamwork and address both social and economic consequences of engineers' work. Most importantly, all EL programs across the two national contexts characterize leadership as a teachable and learnable competency essential to the personal and professional development of engineers.

Limitations

This is not a research report. In the fall of 2019, as members of the ASEE LEAD division executive, the two co-authors were given one week to assemble a panel of Canadian engineering leadership directors to honour the (intended) 2020 Montreal location of the Conference. While we both hold leadership positions in North American EL institutes and both conduct research on EL in university and workplace settings, neither of us is an expert in pan-Canadian engineering leadership programing. Our limited knowledge of the full spectrum of Canadian programs prompted us to reach out to and survey our colleagues across the country. We are not making claims about best practices, nor are we suggesting that this is an exhaustive list of EL programs in Canada. We have simply taken advantage of an international opportunity to highlight a wider spectrum of Canadian EL programs than could feasibly be shared through a 30-minute panel. To this end, we compiled profiles and generated cross-program comparisons based on the survey responses of 11 program directors and champions affiliated with a Canadian community of practice on engineering leadership (NICKEL). A key limitation of our findings reflects the composition of our networks. We reached out to members of NICKEL—who explicitly focus on leadership development in engineering education. One respondent[4] accurately pointed out that we should clarify the differences between engineering leadership, engineering management and engineering entrepreneurship programing. While we could cite conceptual differences between leadership and management, we lack the survey data and necessary networks to make an empirical distinction. Thus, we encourage engineering educators with closer ties to engineering management program directors to supplement this report by surveying their colleagues. Together, we would be in a better position to bridge our respective disciplines. Finally, our decision to survey program directors and senior level EL champions has consequences for program improvement. We are missing the voices and lived realities of students, staff and faculty members involved in EL programing. Ethnographic case studies paired with cross-case analyses would help bridge the gap between birds' eye view reports such as this one and individual case studies written from the perspective of program directors. The combined depth and analytic grist of a cross-case ethnographic study has important implications for program improvement and EDI (equity, diversity and inclusion).

EL program profiles are posted with permission from survey participants who were supportive of having their programs highlighted at the annual ASEE conference in Montreal.

[3] Degree granting programs are a clear exception to this trend.

[4] We are grateful to Mike Lipsett, Professor and Ernest & Gertrude Poole Chair in Management for Engineers, Director of Innovation, Creativity & Entrepreneurship Programs at the University of Alberta—for providing us with this helpful feedback.

Part A: Cross-Program Comparisons

Engineering Leadership development in Canada is supported through leadership development institutes, centres, curricular integration into core design courses, degree granting programs, certificates, specializations, stand-alone courses, and endowed chairs. The fifteen programs on our radar are listed (West to East) in Figure 1 below.

Figure 1: Canadian Engineering Leadership Programs

Engineering Leadership Programs/Initiatives (survey participants)

- Master of Engineering Leadership (MEL)—University of British Columbia (UBC)
- Engineering Leadership Program (ELP)—University of Calgary (U of C)
- William and Elizabeth Magee Chair in Chemical Engineering Design—David and Joan Lynch School of Engineering Safety and Risk Management (ESRM)—University of Alberta (U of A)
- Centre for Engineering Professional Practice & Engineering Education—University of Manitoba (U of M)
- John M Thompson Centre for Engineering Leadership and Innovation—Western University (Western)
- Turkstra Chair in Urban Engineering—University of Waterloo (UW)
- Engineering Leadership Graduate Course—University of Guelph (U of G)
- Troost Institute for Leadership Education in Engineering (Troost ILead)—University of Toronto (U of T)
- Centre for Engineering in Society—Concordia University (Concordia)
- GoLEAD—McGill University (McGill)
- Bachelor of Science in Sustainable Design Engineering—University of Prince Edward Island (UPEI)

NICKEL-affiliated Institutions (no survey data)

- Certificate in Engineering & Professional Communication & Engineering Entrepreneurship option—University of Saskatchewan
- Certificate in Leadership and Community Engagement—McMaster University
- Masters and Specialization in Engineering Innovation & Entrepreneurship—Ryerson University
- Workshops & Co-curricular leadership opportunities—York University

Our cross-program comparison is broken into three sections: origin stories, institutional structure and student programing. The first of these sections examines how, when and why EL programs took root in Canada; the second investigates the central features of EL programs, and the third details program goals, learning objectives and instructional strategies. Our report does not assess program impact.

Origin Stories

How, when and why did EL programing begin in Canada?

Engineering leadership programs are a relatively new phenomenon in Canada, with the earliest introduced in 2002 and nine of the eleven we surveyed introduced between 2014 and 2019. Please see Table 1 for start dates identified by participants in their survey responses.

Table 1: EL Program start dates by Institution

2002/2011	2006	2007/2016	2014	2015	2018	2019
University of Toronto[5]	Concordia	University of Calgary[6]	University of Manitoba Western University University of Guelph	University of British Columbia University of Alberta University of Prince Edward Island	McGill University	University of Waterloo

Many of these programs began as start-ups driven by an internal university champion committed to supporting the leadership development of engineering students. Others were team efforts catalyzed by a central accreditation push. Finally, one program filled an expanding market after observing growing numbers of engineering students registering for MBAs. Please see Table 2 below for a breakdown of origin stories by program.

Table 2: Origin Stories by Institution

Rationale for program development	University in which leadership program is housed
Champion within the Faculty (Dean/Chair/ Professor) initiated programing to enhance engineering students' leadership and professional skill development.	University of Calgary, University of Alberta, University of Manitoba, University of Guelph, University of Toronto, McGill University, University of Prince Edward Island
Driven by industry leader/endowment—desire to fill skills gap and enhance professional edge of engineering students	Western University University of Waterloo Supplementary catalyst for UofC, UofA & UofT
Driven by Accreditation (CEAB)—(Deans & Department Chairs)	Concordia University Supplementary catalyst for most programs
Engineering alternative to MBA	University of British Columbia

Origin stories not only shape when and how programs begin, but also affirm why they are necessary in the first place. Nine of the 11 programs shared vision and mission statements with us while two (University of Guelph & McGill University) shared only mission statements. We identified themes implicit in these aspirational statements and compiled them in Table 3 below. Student development emerged as a universal theme while social impact, innovation, and entrepreneurship were embedded in more than half of the 11 programs.

Table 3: Vision Statements by Institution

	Student Potential/ Learning	Social Impact	Innovate/ Entrepreneur	Change Agents/ Future	National/ Global recognition	Community Building	Tech. Excel	Global Perspectives	Enhance Status of P.Eng.
UBC	X				X				
U of C	X		X	X	X				
U of A	X	X			X	X	X		

[5] University of Toronto includes two "start dates." The first marks the introduction of co-curricular leadership programing into engineering education (2002) and the second marks the transition from program to institute (2011).

[6] The Engineering Leadership Program at the University of Calgary began as the Maier Leadership Program in 2007. For more details, please see the origin story in the institutional profile.

U of M	X		X			X	X		
Western	X		X						
UW	X	X		X		X	X		X
U of G (M)	X	X	X					X	
U of T	X	X		X	X				X
Concordia	X	X					X		
McGill (M)	X	X	X	X	X	X		X	
UPEI	X	X	X	X			X	X	
Total	11	7	6	5	5	4	4	3	2

Origin Stories Summary: How, when and why did EL programing begin in Canada?

Engineering leadership programing in Canada began to proliferate in the early to mid 2010s as internal champions at several universities sought to supplement highly technical degree programs with professional development opportunities for students. Institutional vision statements suggest that this foundational student development goal was fueled by a desire to drive innovation, foster workplace readiness, and help graduates make a socially-responsible difference in the world. Buoying the unwavering efforts of internal champions, EL programs in Canada, like those in the United States, depend on industry support, networks of EL educators across the country doing similar work, and buy-in from central administration. Finally, many Canadian EL efforts were catalyzed, and in some cases scaled-up, by Deans and Department Chairs preparing to meet CEAB accreditation requirements.

Program Characteristics

What are the central features of Canadian EL programs?

Survey respondents shared a wide range of EL initiatives including elective courses, personal development opportunities and compulsory leadership-integrated design courses. The range of initiatives varied not only from institution to institution but also from geographic region to geographic region. With a few exceptions, EL programs in Ontario and Quebec stand on a foundation of co-curricular leadership learning opportunities and elective courses, while those in the western provinces and our one eastern representative favoured curricular integration of leadership theory, activities and questions into core design courses for all undergraduate students. Two of the universities included in our survey had full EL degree programs—the University of British Columbia and the University of Prince Edward Island. Please see Table 3 below for a breakdown of program type by institution.

Table 4: Program Type by Institution

	Degree Program	Leadership Development Institute/Centre	Curricular Integration of Leadership→ Design	Initiative (stand-alone course/ recently endowed Chair)
UBC	X (Grad)			
U of C		X		
U of A			X (permeates program)	
U of M			X	
Western		X		
UW				X (recently endowed Chair)
U of G				X (EL graduate course)
U of T		X		
Concordia			X	
McGill		X		
UPEI	X (U/G)		X	

While we have endeavored to group universities by program type, most of the institutions we surveyed blend a wide range of features or EL delivery mechanisms. More than half offer courses, course integration, co-curricular programing and outreach, while slightly fewer than half conduct engineering education research—in a few cases foregrounding leadership. Please see Figure 2 for an illustration of delivery mechanisms by prominence and Table 5 for institution-specific breakdowns.

Figure 2: Delivery Mechanisms

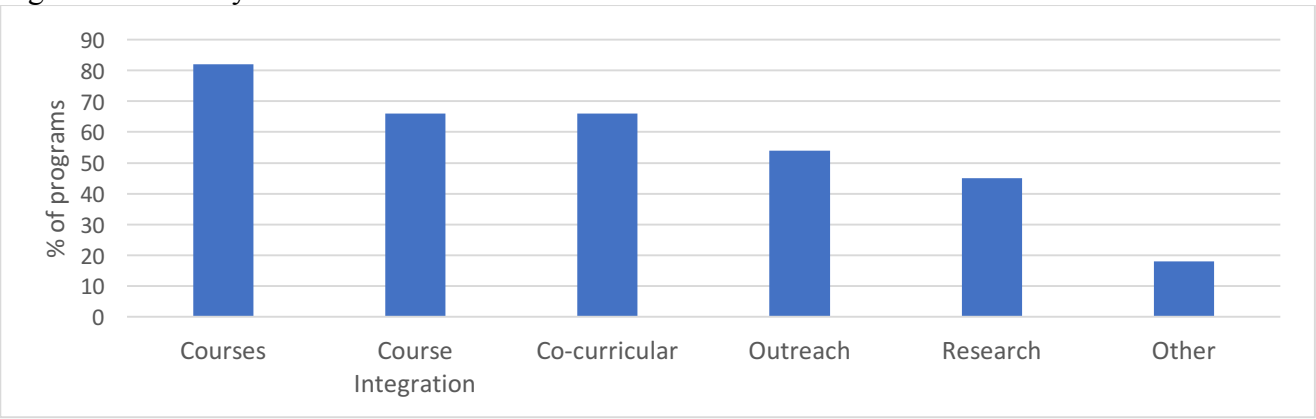


Table 5: Delivery Mechanisms by Institution

	Courses	Course integration	Co-curricular	Outreach	Research[7]	Other
UBC	X	X	X			
U of C			X			
U of A	X	X	X	X	X—EL	Industrial Community of Practice Support
U of M	X	X		X	X	
Western	X	X	X	X		
UW	X	X	X	X	X	
U of G	X					
U of T	X	X	X	X	X—EL	
Concordia	X				X	
McGill			X			
UPEI	X	X		X	X—EL	Year-long, client-based engineering design team projects focusing on real-world solutions.

More than 80% of the institutions we surveyed serve undergraduate engineering students, with the majority offering leadership learning opportunities to graduate students as well. Slightly fewer than half of the programs offer EL professional development opportunities to industry. Finally, a growing number of programs reach out to alumni in an effort to track program impact and support life-long leadership learning. Please see Figure 4 for an illustration of target audiences by prevalence, and Table 6 for a breakdown of target audience by institution.

Figure 3: Target Audience

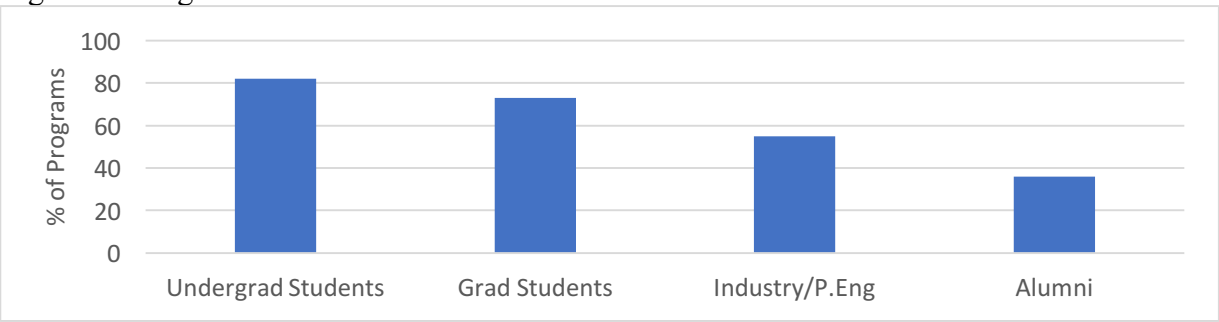


Table 6: Target Audience by Institution

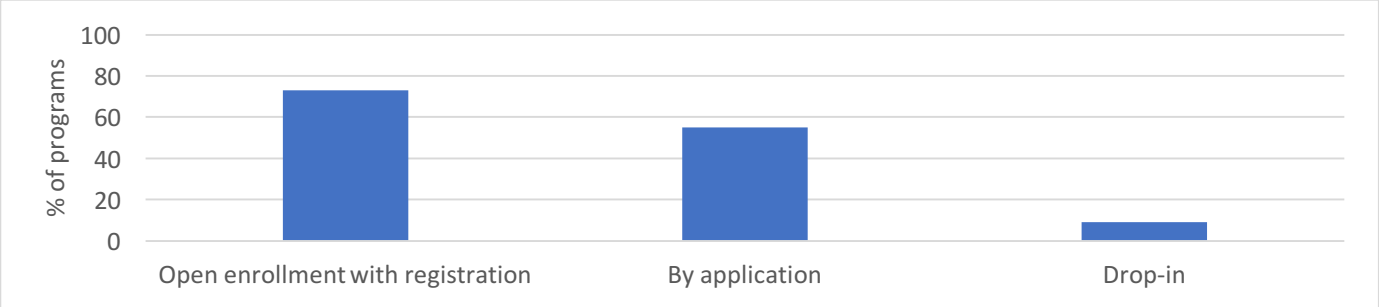
	Undergrad Students	Grad Students	Industry/P.Eng	Alumni
UBC		X	X	
U of C	X			
U of A	X	X	X	X
U of M	X		X	
Western	X	X		
UW	X	X	X	X
U of G		X		
U of T	X	X	X	
Concordia	X	X		
McGill	X	X		X
UPEI	X		X	X

Most of the EL programs in our survey have open-access policies—either because they are mandatory for all students, or because they combine open enrollment with registration. Participant restrictions exist for the latter of these two program types, but they are more often based on room capacity, fire safety ordinances and

[7] The EL notation under the research column identifies programs with a history of presenting engineering leadership research at national and international conferences. Others with an "x" in the research column support socio-technical research through their engineering education centres under a broader engineering education umbrella.

pedagogical feasibility than on student achievement or leadership potential. The foundational belief underpinning these open-access decisions is that all engineering students can and should engage in leadership learning opportunities over the course of their undergraduate education. Please see Figure 4 for an illustration of program access by prevalence and Table 7 institutional breakdowns.

Figure 4: Program Access



This commitment to universal access is a key feature of Canadian EL programs. Studies by Graham, Klassen, and Paul [4, 5, 10, 13] suggest that EL programs in the United States are more often bounded through selective, multi-year cohorts. These two sets of enrollment decisions have their advantages and disadvantages. Open enrollment policies rooted in the principle of universal access tend to be more inclusive, while application-based cohort programs are more likely to facilitate leadership identity formation in students. The bounded nature of multi-year cohort programs also makes it easier to measure program impact over time since it is clear who is an engineering leadership student. In contrast, students who are exposed to leadership development opportunities through mandatory design courses may not think of their experiences as capital "L" leadership learning. This may explain the phenomenon of resistance to leadership identification among Canadian engineers [14-16].

Table 7: Program Access by Institution

	Open enrollment w registration	By application	Drop-in	Other/Explanation
UBC		X		
U of C	X	X		Students must apply to the program, but we are not selective with enrollment
U of A	X	X		ESRM is a core requirement for all undergraduate engineering students
U of M				The Centre's scope touches the entire undergrad engineering curriculum and works in the spaces between departments, facilitating opportunities that don't reside within a specific discipline
Western	X	X		
UW	X			
U of G	X			
U of T	X	X	X	We have drop-in and cohort based programs. A small number of these programs involve applications. Most are open to all students. Courses fill up on a first come, first served basis
Concordia	X			
McGill	X			
UPEI		X		

Moving from program access to degree of institutionalization, Canadian EL programs driven by a centralized accreditation push were institutionalized from the start, while those driven by internal champions have required directors to be more entrepreneurial in their respective quests to achieve institutional recognition, status and permanence. At the time of the survey, more than half of the programs included leadership learning elements that were required for graduation. The same percentage of programs had elective elements with formal recognition—either through course credit, certificate or diploma based on EL course concentration, or a Co-

Curricular Record (CCR)[8] based on student leadership involvement beyond the classroom. Figure 5 illustrates degree of institutionalization by prevalence while Table 8 provides institutional breakdowns.

Figure 5: Degree of Institutionalization within the Faculty of Engineering

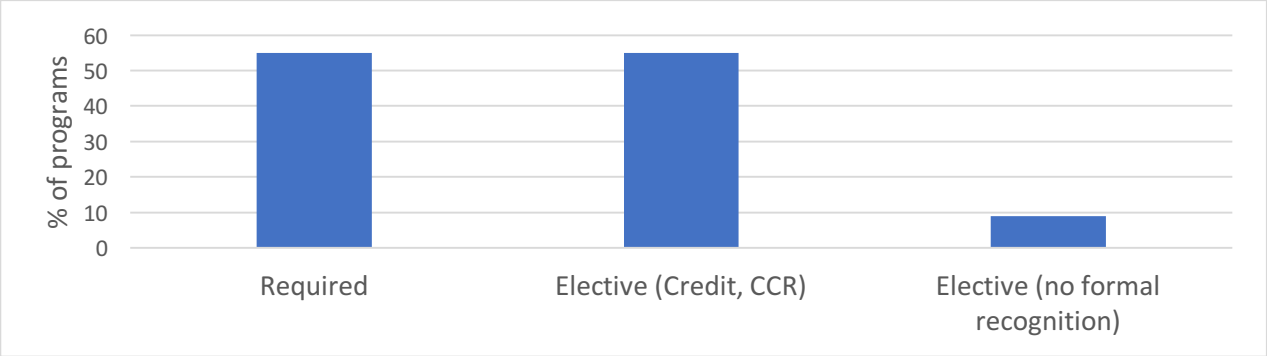


Table 8: Degree of Institutionalization by Institution

	Required for graduation	Elective w formal recognition (Credit, Certificate, CCR)	Elective, no formal recognition	Other/Explanation
UBC	X			It is a degree in itself
U of C		X		
U of A	X	X		2 design courses and intro ESRM course are mandatory, additional elective courses available. Leadership recently integrated into 2 core first year courses (Fundamentals & Design).
U of M	X			the Centre's work is integrated with undergraduate program offerings
Western	X	X		We are responsible for first year design, communications, engineering economics, ethics, law and sustainability. The certificate program is elective on the student's part
UW			X	
U of G		X		
U of T		X		
Concordia	X			
McGill		X		
UPEI	X			

Institutional Structure Summary: What are the central features of Canadian EL programs?

A wide range of leadership learning opportunities exist in Canadian faculties of engineering, but two prominent programmatic structures have taken root—one foregrounding elective courses, co-curricular leadership opportunities, and certificate programs; and another modeled on compulsory engineering design education. These two prevailing structures emphasize different delivery mechanisms, with the first prioritizing co-curricular learning and the second prioritizing curricular integration. In both cases, the target audience is undergraduate students, with expanding options for graduate students. EL programing in Canada, with a few exceptions, is built on the principle of universal access. That is, students are either mandated or afforded the opportunity to hone their leadership skills in the absence of a competitive application process. While this process is more inclusive, the lack of boundedness makes it difficult to measure program impact.

[8] The CCR is an increasingly prevalent institutional strategy for recognizing that leadership learning occurs beyond the classroom. It supplements academic transcripts, providing students with official recognition of co-curricular involvement. Faculty advisors are often required to sign a form attesting to student involvement in a club or other qualifying opportunity. In most cases CCR credit depends on positional club leadership status.

Student Programing

What is the purpose of EL education and how does it unfold?

Before we share our findings about student programing, we must be honest about the methodological limitations of our process. This report is a bird's eye view of Canadian EL programing. Our primary goal in the limited time we had was to chart the Canadian EL landscape in order to educate ourselves and ASEE LEAD members about the wide range of leadership learning opportunities in Canadian faculties of engineering. As such, we exclusively surveyed institute directors and EL champions, asking questions that tap broad structural features of their programs. These sampling and data collection decisions privileged breadth and expedience over depth. Detailed case studies would have resulted in a more nuanced, multi-faceted report, with textured illustrations of day to day operations from the varied perspectives of instructional staff, faculty affiliates and students.

Methodological limitations aside, we did ask four questions about student programing that highlight program goals, learning objectives, conceptions of leadership and instructional strategies. We present the findings from these four survey questions in the final section of our cross-case analysis. When it came to program goals, survey respondents overwhelmingly identified the salience of personal and professional development, with social impact and fostering industry relationships not far behind. Please see Figure 6 for program goals by prevalence and Table 9 for corresponding institutional breakdowns.

Figure 6: Program Goals

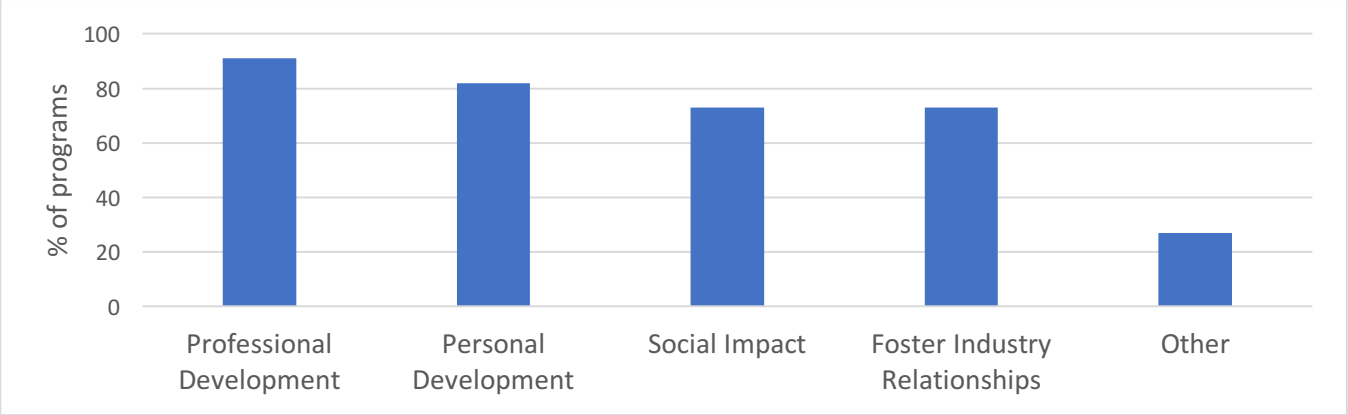


Table 9: Program Goals by Institution

	Personal Development	Professional Development	Foster Industry Relationships	Social Impact	Other
UBC	X	X	X	X	
U of C	X	X	X	X	
U of A	X	X	X	X	design, CEAB, employability, life-long learning
U of M		X	X		
Western	X	X			
UW	X	X	X	X	
U of G	X	X	X		bring leadership into the engineering context
U of T	X	X	X	X	
Concordia				X	
McGill	X	X		X	
UPEI	X	X	X	X	sustainability mindset as a global citizen and engineer

Related to the idea of program goals was a question about learning objectives. What did instructors and programming staff expect students to be able to do by the end of a course, workshop or degree program? All but one director emphasized the importance of learning to work in teams, all but two spoke about the importance of learning how engineers' actions impact society, 73% indicated the importance of self-awareness, and 64%

spoke about helping students learn to navigate organizational contexts. Please see Figure 7 for an illustration of learning objectives by prevalence and Table 10 for the corresponding institutional breakdown.

Figure 7: Learning Objectives

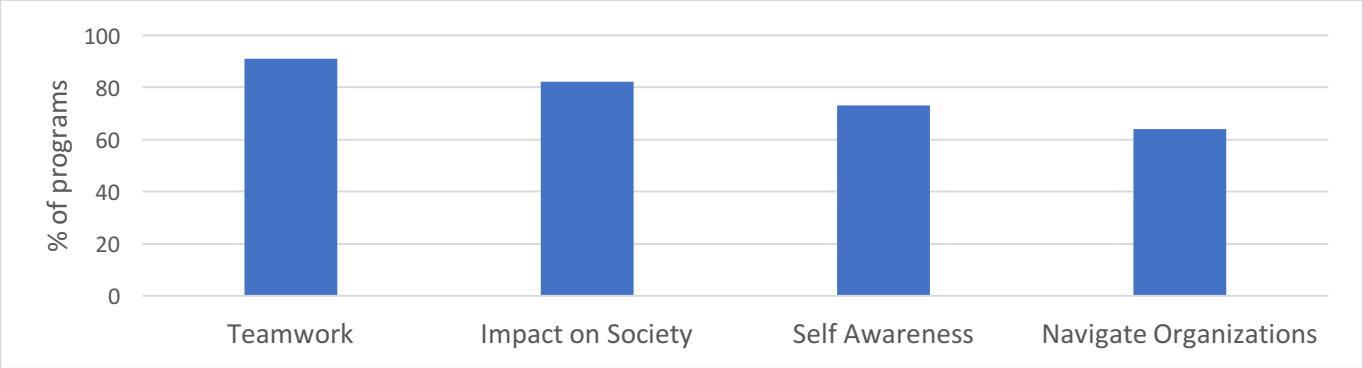
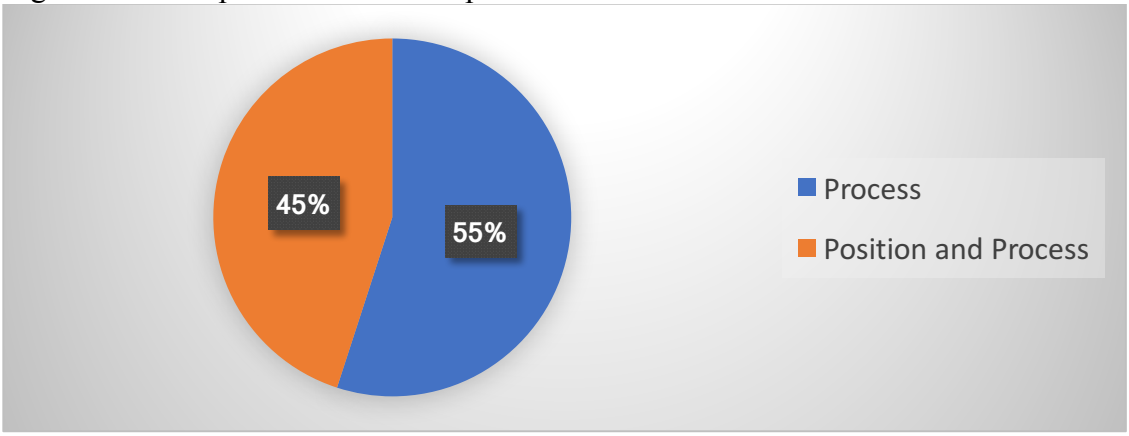


Table 10: Learning Objectives by Institution

	Learning to work in teams	Learning how one's actions impact society	Learning about oneself	Learning to navigate org contexts	Other/Explanation
UBC	X	X	X	X	
U of C	X	X	X		
U of A	X	X	X	X	
U of M	X				
Western	X	X	X	X	
UW	X	X			
U of G	X	X	X	X	
U of T	X	X	X	X	Learning how to navigate org contexts is primarily at the grad level, though it is introduced at the undergrad level
Concordia		X			Our learning focuses on enhancing ethical, communicative and contextual awareness that allows students to alter their position in the professional landscape
McGill	X		X	X	
UPEI	X	X	X	X	

Komives' Leadership Identity Development model [17, 18] has informed many university-based leadership development programs. In it, she asserts that leadership learning involves embracing the notion of leadership as a process which transcends position. Our survey explicitly tapped this conceptual distinction. 55% of survey respondents indicated that their programs were based on the notion of "leadership as a process," while the remaining 45% selected "leadership as both a process and a position."

Figure 8: Conception of Leadership



Please see Figure 8 for a pie chart illustrating the percentage of programs based on each of the two leadership conceptions, and Table 11 for the corresponding institutional breakdown. With a few exceptions, directors of elective, co-curricular EL programs were more likely to select "process," while directors of programs built on the engineering design model were more inclined to select both process and position. One possible explanation for this difference involves the accreditation-driven nature of the second model combined with the CEAB's explicit identification of "economics and project management" as a graduate attribute.

Table 11: Conception of Leadership by Institution

	Process	Position & Process	Explanation
UBC		X	
U of C		X	
U of A		X	Leadership and management start with self-knowledge and development. Leadership positions require further development to fulfill the objectives of the role
U of M	X		
Western		X	
UW	X		
U of G	X		
U of T	X		
Concordia	X		
McGill	X		
UPEI		X	

The final question in our survey invited directors to identify the pedagogical strategies used by instructors to scaffold student learning. Most combined active learning or experiential education with theory-based lectures, discussions and readings. All used a combination of large group discussions, small group activities and personal reflection. Please see Figure 9 for an illustration of instructional strategy by prevalence and Table 12 for the corresponding institutional breakdown.

Figure 9: Instructional Strategy

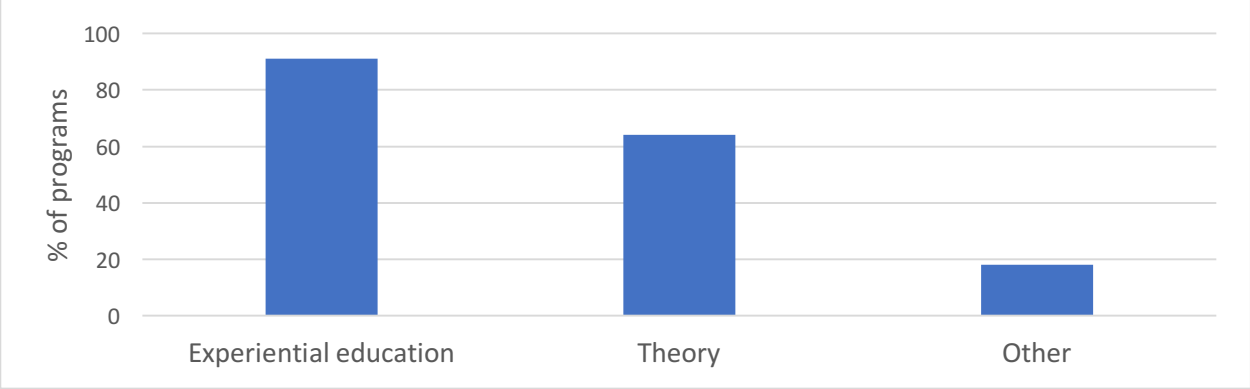


Table 12: Instructional Strategies by Institution

	Experiential education	Theory	Other/explanation
UBC	X	X	
U of C	X	X	
U of A	X	X	We provide learning activities that allow for discussion and thinking about how students will apply the concepts to their teamwork
U of M	X		
Western	X	X	
UW	X		

U of G	X	X	
U of T	X	X	
Concordia			
McGill	X		
UPEI	X	X	

Student Programing Summary: What is the purpose of EL programing and how does it unfold?

The purpose of EL programing in Canada from the perspective of program directors is to support the personal and professional development of engineering students, catalyze social impact, and foster industry relationships. Instructors blend active learning pedagogy with theory to scaffold students' leadership development across levels of analysis--emphasizing teamwork, social responsibility, and self awareness. In most cases, EL educators view leadership as a process that transcends position, while recognizing the importance of preparing students to make a positive difference to their teams, organizations and society from a wide range of roles, responsibilities and positions.

Conclusions

Our analysis of 11 Canadian engineering leadership programs from the perspectives of institute directors and EL champions suggest that two distinct models have taken root across the country. Many of the EL programs in Ontario and Quebec foreground the personal development of engineering leaders through a suite of co-curricular and elective course offerings, while programs in the Prairie and (perhaps) Maritime provinces favour an accreditation-driven engineering design approach with compulsory leadership learning opportunities integrated into the core curriculum. Compared to the US-based EL programs examined by Graham, Klassen, and Paul [4, 5, 10, 13], the Canadian programs we highlight in this report are slightly less institutionally bounded. Rather, they tend to favour either universal access or universal implementation of leadership learning opportunities for undergraduate, and in some cases graduate engineering students. Both Canadian and US-based EL programs blend socio-technical competencies, place high value on teamwork and address the social and economic consequences of engineers' work. Most importantly, all EL programs across the two national contexts characterize leadership as a teachable and learnable competency essential to the personal and professional development of engineers.

Part B: Engineering Leadership Program Profiles

Master of Engineering Leadership (MEL) @ University of British Columbia

Question	Multiple Choice/Summary	Open ended
University	University of British Columbia	
Origin date	January, 2015	
Director	Tamara Etmannski	
Vision	Where engineering leaders are made	
Mission	MEL is a graduate degree that provides curated leadership and technical training for professional engineers that is relevant to their own industry. MEL helps professional engineers advance their career, and helps industry fill a unique technical leadership gap within many organisations.	
Origin Story	Since 30-50% of MBA students are professional engineers, we realized that a very normal career trajectory of an engineer is to move into a leadership position within their organisation. It is at that stage that they may consider enrolling in an MBA program. However practicing engineers often do not want to transition into a finance-only, accounting-only or marketing-only role, which is the training received when doing an MBA. This led to UBC questioning whether we can provide engineers with more relevant training, both leadership and technical in nature, that would better suit them in industries like clean energy, high performance buildings, software systems, water management, urban systems, advanced materials/manufacturing, sustainable process engineering, naval architecture and marine engineering. That is when the Master of Engineering Leadership was born. The MEL has eight industry specialties to choose from. Within each specialty, a MEL student will gain a macro understanding of the value chain for that industry, as well as learn the basics of finance, accounting, organisational behavior, change management and business strategy. Students also reflect inward and explore leadership from the perspectives of self, team, organisation and societal impact as it relates to them as professional engineers. They learn leadership theory and have many opportunities to put their skills into practice throughout the one year intensive program (Jan-Dec). We are now in our 5th year and have over 100 professional graduate students enrolled per year.	
Program Type	Degree Program (Graduate)	
Program Goals	**X Personal development** **X Professional development** **X Foster industry relationships** **X Social impact**	
Program elements	**X Co-curricular** **X Courses** **X Course integration** Research Outreach	
Target audience	Undergraduate students **X Graduate students** **X Industry/P.Eng** Alumni	
Participant access	**X By Application** Open to all students by registration Drop-in	
Program status in faculty	Required for graduation Elective w formal recog (credit, CCR) Elective no formal acknowledgement **Other**	Degree Program –Master of Engineering Leadership
Learning objectives	**X Learning about oneself** **X Learning to work in teams** **X Learning to navigate org contexts** **X Learning how actions impact society**	
Leadership as position/process	Position Process **X Both**	
Pedagogy	Theory Experiential education **X Both**	
Website	https://apscpp.ubc.ca/programs/mel/	

Engineering Leadership Program (ELP) at University of Calgary

Question	Multiple Choice/Summary	Open ended
University	University of Calgary, Schulich School of Engineering	
Origin date	2007/2016	
Director	Paul Ziade (Associate Dean, Student Professional Development) Emily Wyatt (Manager, Student Experience)	
Vision	To be recognized as the leader in Canada in developing the engineering leaders & entrepreneurs of tomorrow.	
Mission	Provide co-curricular experiences that ensure Schulich graduates will be leaders in their field, prepared with skills to innovate, engage others, and positively contribute to our communities and industry.	
Origin Story	Designed by a previous Associate Dean (Dr. Arin Sen) and graduate student (Robyn Paul), the Engineering Leadership Program began as the Maier Leadership Program in 2007. This start up program was designed to build leadership skills outside of the classroom—targeted primarily at students in club leader roles. Over the years, the program expanded to include all engineering students. In 2016, the program was institutionalized as ELP. It currently includes close to 500 students, including 30 percent of the first-year student class.	
Program Type	Suite of co-curricular engineering leadership programs	
Program Goals	**X Personal development** **X Professional development** **X Foster industry relationships** **X Social impact** Other	
Program elements	**X Co-curricular** Courses Course integration Research Outreach Other	
Target audience	**X Undergraduate students** Graduate students Industry/P.Eng Alumni Other	
Participant access	**X By Application** **X Open to all students by registration** Drop-in Other	Students must apply to the program, but we are not selective with the acceptance process
Program status in faculty	Required for graduation **X Elective w formal recog (credit, CCR)** Elective no formal acknowledgement Other	
Learning objectives	**X Learning about oneself** **X Learning to work in teams** Learning to navigate org contexts **X Learning how actions impact society** Other	
Leadership as position/process	Position Process **X Both** Other	
Pedagogy	Theory Experiential education **X Both** Other	
Website	https://schulich.ucalgary.ca/current-students/undergraduate/launching-your-career/engineering-leadership-program	

Chemical Engineering Design @ University of Alberta

Question	Multiple Choice/Summary	Open ended
University	University of Alberta, Faculty of Engineering David and Joan Lynch School of Engineering Safety and Risk Management (ESRM)	
Origin date	2015	
Director	Marnie Jamieson, Marnie Jamieson, M.Sc., P.Eng., William and Elizabeth Magee Chair in Chemical Process Design, Industrial Professor. **ESRM Directors/Leadership:** Christopher Coles, M.Sc., P. Eng., Associate Director, David and Joan Lynch School of Engineering Safety and Risk Management, Industrial Professor Lianne Lefsrud, Ph.D., P. Eng., Assistant Professor, David and Joan Lynch School of Engineering and Risk Management Gord Winkel, M.Sc., P.Eng., Director and Chair, David and Joan Lynch School of Engineering Safety and Risk Management. **Innovation/Entrepreneurship Leadership:** Mike Lipsett, Ph.D. P.Eng., Professor and Ernest & Gertrude Poole Chair in Management for Engineers Director of Innovation, Creativity & Entrepreneurship Programs	
Vision	University of Alberta Vision: To inspire the human spirit through outstanding achievements in learning, discovery, and citizenship in a creative community, building one of the world's great universities for the public good. We are aligned with the U of A Vision and support it. We present this to our students at the beginning of the first process design course. Our new Engineering at Alberta Vision: "To be the most daring engineering community on the planet." This vision (and mission) will be incorporated in Fall, 2020. https://www.ualberta.ca/engineering/about-us/index.html	
Mission	Process Design Teaching Team Mission: Provide a learning environment to enable our students to become innovative and responsible contributors to society while continuously improving the alignment of learning objectives and student assessment leading to student constructed process design learning experiences supported by leadership, team, project management and life-long learning skills. We present this to students at the beginning of the first process design course alongside the U of A Vision. Engineering at Alberta Mission: We are engineers united by our unwavering dedication to solving the world's greatest challenges and building a better future for society.	
Origin Story	We have been teaching design since the 1950's. Although engineers have typically worked on teams in organizations, the expectations of our graduates have shifted. We found them underprepared for the demands of complex process system design. In 2011/2012 we began helping students learn about the team skills they needed as part of the capstone design course. In 2012, the William Magee Chair was inaugurated. In 2013/14 we began developing instructional/learning components designed to teach team, leadership, and project management skills to students in both design courses. This developed into a staged approach over two courses in order to further support CEAB graduate attribute development in our students. We have another program element that was developed in parallel - engineering leadership in safety and risk management, which also fosters team and leadership skills in students. This program has its roots dating back to 1989 with a required safety and risk management course for Mining and Petroleum engineering, and as an option open to the other engineering disciplines. The program was reconfigured into our newly formed David and Joan Lynch School, inaugurated in 2015. Further courses aimed specifically at leadership development and/or teamwork component are now offered as electives. Additionally, ESRM and the electives are open to all engineering students and the ESRM fundamentals course is mandatory for all engineering undergraduate programs, a unique achievement in Canada. A shift to innovation practices and projects has been cultivated in chemical engineering design as a part of the blended learning redevelopment and the Faculty of Engineering as a whole. In 2018, the engineering innovation and entrepreneurship summer course was inaugurated. The U of A had a graduate degree program in engineering management (ENGM), which also includes leadership components. In 2020, a new diploma program in engineering leadership has been added. The Diploma in Professional Leadership and Management is a flexible non-credit credential equivalent to one year of full-time course work and projects, which must be completed within 24 months. The diploma has nine courses, a practicum and a capstone project. The diploma learning outcomes focus on leadership, management, and safety and risk management skill development. Participants will gain insight in ethical matters, law, and working with diverse groups of people and understanding First Nations and Metis settlements and Metis rights and treaties in an Alberta and Canadian industry.Candidates within the diploma bring exceptional professional and personal achievements, allowing them to contribute to and get the most from the collaborative in-class and off-line learning environment. Participants typically work full-time while managing the demands of the diploma.	

	Success requires strong time-management skills and high scholastic capabilities, and an aptitude for fluent interpersonal collaboration	
Program Type	Co-ordinated team with shared interests (curricular integration→ core u/g & EL diploma/ EM degree grad)	
Program Goals	**X Personal development** **X Professional development** **X Foster industry relationships** **X Social impact** **X Other**	Design competence, CEAB graduate attribute development, employability in a variety of sectors and encourage life-long learning
Program elements	Co-curricular **X Courses** **X Course integration** **X Research** **X Outreach** **X Other**	Industrial Community of Practice Support Optional course: ENGG 260 Innovation and Entrepreneurship with Engineers https://www.ualberta.ca/engineering/student-services/clubs-projects-competitions.html i.e. Internal EngComm competition and U of A team development Student project teams
Target audience	**X Undergraduate students** **X Graduate Students** **X Industry/P.Eng.** **X Alumni**	
Participant access	**X By Application (ENGM)** **X Open to all students by registration** Drop-in **X Other**	All chemical engineering undergraduates—part of the core I answered the above question specifically for the process design course sequence. I lead this part of the program. Gord Winkel, Christopher Coles, and Lianne Lefsrud are all part of the ESRM school and we collaborate on leadership development. I have included them as leaders/directors at the University of Alberta as the work we do is related and integrated for chemical engineering students. For the ESRM component - there is a mandatory first course - all U of A engineering students take this course. There are elective courses that all students can take including an elective process safety management course. In addition, there are courses where students need to meet criteria and must apply to a specific program option to be allowed to take them (Engineering Leadership Lab). Our courses use a variety of instructional methods and learning activities.
Program status in faculty	**X Required for graduation** Elective w formal recog (credit, CCR) Elective no formal acknowledgement **X Other (degree & diploma)**	The introductory and capstone chemical engineering design courses (CH E 464 and 465) and the ESRM first course (ENGG 404) are mandatory parts of the undergraduate program - all chemical engineering students who graduate take them. There are additional courses graduate and undergraduate students may take as electives in leadership innovation and risk management. In addition, we have added two new courses to first year in support of early and universal leadership and innovation development alongside student success and persistence. ENGG 100 Success in Engineering and ENGG 160 Engineering Design are both required courses. ENGG 260 Innovation and Entrepreneurship with Engineers is an optional course. ENGM is a degree program and the new EL diploma is a graduate program.
Learning objectives	**X Learning about oneself** **X Learning to work in teams** **X Learning to navigate org contexts** **X Learning how actions impact society**	In our chemical engineering design program we use active and experiential learning modes in a blended learning environment.
Leadership as position/process	**X Position** **X Process** **X Both** **X Other**	Leadership and management development start with self-knowledge and development. Positional leadership requires an individual to build on the skills needed for self-leadership and management. Leadership positions require more skills and further development to fulfill the objectives of the role.

Pedagogy	**X Theory** **X Experiential education** **X Both** **X Other**	We provide learning activities that allow for discussion and thinking about how students will apply the concepts to their teamwork that term.
Website	We don't have a website specifically about the process design courses and leadership development within them. You can learn more about us at the following websites: Chemical Engineering: https://www.ualberta.ca/chemical-materials-engineering/undergraduate-studies Capstone Design: https://www.ualberta.ca/engineering/news/2016/september/ken-sury-memorial-prize-in-chemical-engineering-design-honours-an-engineer-of-creative-intellect David and Joan Lynch School of Engineering Safety and Risk Management: https://www.ualberta.ca/engineering/departments/engineering-safety-and-risk-management Engineering Management: https://www.ualberta.ca/mechanical-engineering/research/engineering-management Innovation and Entrepreneurship: https://www.ualberta.ca/research/innovation/at-ualberta https://www.ualberta.ca/engineering/student-services/innovation-creativity-entrepreneurship https://www.ualberta.ca/engineering/news/2018/may/interdisciplinary-approach-breaks-barriers-to-entrepreneurship Engineering at Alberta: https://www.ualberta.ca/engineering/about-us/index.html https://www.ualberta.ca/engineering/index.html Engineering at Alberta: https://www.ualberta.ca/engineering/about-us/index.html https://www.ualberta.ca/engineering/index.html	

Centre for Engineering Professional Practice & Engineering Education (CE2P2E) @ University of Manitoba

Question	Multiple Choice/Summary	Open ended
University	University of Manitoba	
Origin date	The Centre was established in 2014.	
Director	Marcia Friesen	
Vision	The Centre will be a community recognized for leadership, innovation, expertise, and partnerships in the pursuit of engineering education excellence.	
Mission	The Centre views student learning in professional skills and design abilities as core technical and leadership competencies essential for their diverse future roles in the engineering profession and the community. Accordingly, the Centre collaborates with departments in the Faculty of Engineering and develops and delivers professional practice and design curricula, drawing on the scholarship of teaching & learning in engineering and educational collaboration with industry partners. Its scope has since grown to include supporting an expansion of student design competition teams and creating makerspaces in the Faculty, facilitating design education beyond capstone courses via new electives and design spines, expanding industry-based educational partnerships, and supporting graduate scholarship in engineering education.	
Origin Story	The Centre began as an informal affinity group in the early 2000s, of engineering faculty interested in increasing the industry readiness of graduate engineers by enhancing the design components of the undergraduate curriculum. In the early 2000s, the "Design Group" group focused on establishing an engineer-in-residence program, developing capstone design courses in all undergraduate programs, and strengthening the delivery of core professional practice courses.	
Program Type	Centre & Curricular integration into core undergraduate engineering education	
Program Goals	Personal development **X Professional development** **X Foster industry relationships** Social impact	
Program elements	Co-curricular **X Courses** **X Course integration** **X Research** **X Outreach** Other	
Target audience	**X Undergraduate students** Graduate students **X Industry/P.Eng** Alumni Other	
Participant access	By Application Open to all students by registration Drop-in **X Other**	The Centre's scope touches the entire undergraduate engineering curriculum and works in the space "between" departments, facilitating opportunities that don't reside within a specific discipline.
Program status in faculty	Required for graduation Elective w formal recog (credit, CCR) Elective no formal acknowledgement **X Other**	The Centre's work is integrated with undergraduate program offerings.
Learning objectives	Learning about oneself **X Learning to work in teams** Learning to navigate org contexts Learning how actions impact society Other	
Leadership as position/process	Position **X Process** Both Other	
Pedagogy	Theory **X Experiential education** Both	
Website/Contact	https://umanitoba.ca/faculties/engineering/departments/depts_ce2p2e.html	

John M. Thompson Centre for Engineering Leadership and Innovation @ Western University

Question	Multiple Choice/Summary	Open ended
University	Western University	
Origin date	September, 2014	
Director	Darren Meister	
Vision	Develop the Leadership and Innovation Potential in Every Western Engineer	
Mission	The Thompson Centre is the academic unit that is the lead partner within Western Engineering for student development in the areas of: – Leadership and team development – Communication skills – Professionalism – Impact of engineering on society and the environment – Ethics and equity – Entrepreneurship, Project Management and Business.	
Origin Story	John M. Thompson (a 1966 graduate and retired Vice-Chair of IBM) had long advocated a stronger role in leadership and innovation education at Western. The Dean Andy Hrymak was very supportive and through much work the initiative was launched. Darren Meister, an Ivey Business School faculty member since 2002 and an engineering PhD graduate from the University of Waterloo was recruited as the first Thompson Chair. In 2018, the formal Centre was established and in 2019 was renamed the Thompson Centre to recognize John and Melinda Thompson's continued support.	
Program Type	Centre with Certificate (u/g), Diploma (grad) & core courses (see program elements)	
Program Goals	**X Personal development** **X Professional development** Foster industry relationships Social impact Other	
Program elements	**X Co-curricular** **X Courses** **X Course integration** Research **X Outreach** Other	-Undergraduate Certificate in Engineering Leadership and Innovation, -Graduate Diploma in Engineering Leadership and Innovation (approval in process), -core courses in Engineering Ethics, Law and Sustainability, Communications and First Year Design
Target audience	**X Undergraduate students** **X Graduate students** Industry/P.Eng Alumni Other	
Participant access	**X By Application** **X Open to all students by registration** Drop-in Other	Credit certificates rely on application; all other open to all
Program status in faculty	**X Required for graduation** **X Elective w formal recog (credit, CCR)** Elective no formal acknowledgement Other	We are responsible for first year design, communications, engineering economics and ethics, law and sustainability. The Certificate program is elective on the student's part.
Learning objectives	**X Learning about oneself** **X Learning to work in teams** **X Learning to navigate org contexts** **X Learning how actions impact society** Other	
Leadership as position/process	Position Process **X Both** Other	
Pedagogy	Theory Experiential education **X Both** Other	
Website	eng.uwo.ca/tc/	

Turkstra Chair in Urban Engineering @ University of Waterloo

Question	Multiple Choice/Summary	Open ended
University	University of Waterloo	
Origin date	January, 2019	
Director	Nadine Ibrahim	
Vision	The Urban Engineering vision at the University of Waterloo is to build a community of leaders from municipal engineering and academics in urban research, and to develop urban sustainability literacy among students to motivate their technical specializations, empowering them to traverse their disciplines to create livable futures. These efforts aim at increasing the role of civil engineers in urban governance and improving the career opportunities and authority of engineers in decision-making processes in cities.	
Mission	An opportunity to ensure the civil engineers of tomorrow are the new urban leaders, entrusted by society to achieve a sustainable world, while ensuring better quality of life. This new generation of city leaders is necessary to create effective, efficient and sustainable cities that position Canadian metropolitan regions to be globally recognized for their livability and economic competitiveness. Waterloo Engineering has seen the need to uniquely prepare civil engineers who are innovators and integrators of technology, while able to define and solve the difficult problems our nation is facing.	
Origin Story	The Turkstra Chair in Urban Engineering was established through the generous endowment by Carl Turkstra, and the creation of the chair in January 2019, held by Nadine Ibrahim. Carl's vision was to create a role in which the chair would lead a new educational attitude in civil engineering; with a goal to empower civil engineers to take on authority and leadership positions in significant areas of urban engineering. The expectation was that the role would include teaching, and would motivate students to use emerging technologies and engineering methodologies to tackle the world's toughest urban challenges. In this role, the chair would become the chief advocate of civil engineers as municipal leaders and help develop and deliver an innovative curriculum for civil engineers of the 21st century within the Civil and Environmental Engineering department (as well as drawing from the significant resources of the University as a whole).	
Program Type	Curricular integration into core course	
Program Goals	**X Personal development** **X Professional development** **X Foster industry relationships** **X Social impact**	
Program elements	**X Co-curricular** **X Courses** **X Course integration** **X Research** **X Outreach**	
Target audience	**X Undergraduate students** **X Graduate students** **X Industry/P.Eng** **X Alumni**	
Participant access	By Application **X Open to all students by registration** Drop-in	
Program status in faculty	Required for graduation Elective w formal recog (credit, CCR) **X Elective no formal acknowledgement**	
Learning objectives	Learning about oneself **X Learning to work in teams** Learning to navigate org contexts **X Learning how actions impact society**	
Leadership as position/process	Position **X Process** Both	
Pedagogy	Theory **X Experiential education** Both	
Website	https://uwaterloo.ca/urban-engineering-cities/	

Engineering Leadership Graduate Course @ University of Guelph

Question	Multiple Choice/Summary	Open ended
University	University of Guelph	
Origin date	2014	
Director	John Donald	
Vision		
Mission	Support development of engineers as engaged and socially responsible leaders, reflective practitioners, and innovators and stewards of technology in a rapidly changing world.	
Origin Story	Graduate Course in Leadership was proposed by John Donald and accepted for offering in the School of Engineering at the University of Guelph.	
Program Type	Stand-alone course (graduate)	
Program Goals	**X Personal development** **X Professional development** **X Foster industry relationships** Social impact **X Other:**	Bring leadership into the engineering context
Program elements	Co-curricular **X Courses** Course integration Research Outreach Other	
Target audience	Undergraduate students **X Graduate students** Industry/P.Eng Alumni Other	
Participant access	By Application **X Open to all students by registration** Drop-in Other	
Program status in faculty	Required for graduation **X Elective w formal recog (credit, CCR)** Elective no formal acknowledgement Other	
Learning objectives	**X Learning about oneself** **X Learning to work in teams** **X Learning to navigate org contexts** **X Learning how actions impact society** Other	
Leadership as position/process	Position **X Process** Both Other	
Pedagogy	Theory Experiential education **X Both** Other	
Website	https://jrdonald.uoguelph.ca	

Troost Institute for Leadership Education in Engineering (Troost ILead) @ University of Toronto

Question	Multiple Choice/Summary	Open ended
University	University of Toronto	
Origin date	2002 as Leaders of Tomorrow (institutionalized 2011 as ILead)	
Director	Emily Moore	
Vision	Engineers leading change to build a better world	
Mission	inspiring engineering students to see themselves as leaders; equipping students for lifelong leadership development; informing our programs with classroom and workplace research	
Origin Story	The ILead program grew out of a recognition that engineering students were not getting enough preparation in the fundamentals of leadership - communication, networking, etc. An initiative called the Leaders of Tomorrow was started by Doug Reeve in the Chemical Engineering department and went faculty wide in 2007 with the hiring of a staff member, Annie Simpson, who built up the program to include curricular and co-curricular offerings. A research program began in 2011 with the support of an industrial consortium.	
Program Type	Institute	
Program Goals	**X Personal development** **X Professional development** **X Foster industry relationships** **X Social impact** Other	
Program elements	**X Co-curricular** **X Courses** **X Course integration** **X Research** **X Outreach** Other	ELITE certificate (grad)
Target audience	**X Undergraduate students** **X Graduate students** **X Industry/P.Eng** Alumni Other	
Participant access	**X By Application** **X Open to all students by registration** **X Drop-in** Other	We have drop in and cohort based programs. A small number of these programs involve applications. Most are open to all students. Courses fill up on a first come first served basis.
Program status in faculty	Required for graduation **X Elective w formal recogn (credit, CCR)** Elective no formal acknowledgement Other	
Learning objectives	**X Learning about oneself** **X Learning to work in teams** **X Learning to navigate org contexts** **X Learning how actions impact society** Other	Navigating organizational contexts is primarily at the grad level, though is introduced in the undergrad.
Leadership as position/process	Position **X Process** Both Other	
Pedagogy	Theory Experiential education **X Both** Other	
Website	https://ilead.engineering.utoronto.ca/	

Centre for Engineering in Society @ Concordia University

Question	Multiple Choice/Summary	Open ended
University	Concordia University	
Origin date	2006	
Director	Govind Gopakumar	
Vision	To create professional engineers who possess the awareness of technology embedded within a wider social setting.	
Mission	(from website) With state of the art facilities, our world-class research is creating solutions for society's toughest problems. Our faculty members and students are engaged in a multitude of research activities in democratization of science and technology policy, urban infrastructures in developing countries, and characterizing the economic impacts associated with terrorism and natural disasters. Take a look around and learn about our graduate certificate in innovation, technology and society.	
Origin Story	Our department, made up of faculty members engaged in teaching and research egan in response to changes in accreditation and the introduction of graduate attributes by CEAB (Canadian Engineering Accreditation Board)	
Program Type	Centre & Curricular integration into core undergraduate engineering education	
Program Goals	Personal development Professional development Foster industry relationships **X Social impact** Other	
Program elements	Co-curricular **X Courses** Course integration **X Research** Outreach Other	
Target audience	**X Undergraduate students** **X Graduate students** Industry/P.Eng Alumni Other	
Participant access	By Application **X Open to all students by registration** Drop-in Other	
Program status in faculty	**X Required for graduation** Elective w formal recog (credit, CCR) Elective no formal acknowledgement Other	
Learning objectives	Learning about oneself Learning to work in teams Learning to navigate org contexts **X Learning how actions impact society** Other	Our learning focuses on enhancing ethical, communicative and contextual awareness that allows students to alter their position in the professional landscape
Leadership as position/process	Position **X Process** Both Other	
Pedagogy	Theory Experiential education Both **X Other**	Our leadership focus is more unstated than explicit. Our approach has been to understand leadership as a process that emerges from a reflexive process.
Website	https://www.concordia.ca/ginacody/engineering-in-society.html	

GoLEAD @ McGill University

Question	Multiple Choice/Summary	Open ended
University	McGill University	
Origin date	Conception Oct. 2016, first programming January 2018.	
Director	Nate Quitoriano	
Vision		
Mission	goLEAD serves as a gathering point, a resource, and a project development incubator for those in the community who seek to affect local and global change. We work collaboratively to support and empower people to set and achieve their goals to better the world. In doing so we will train future leaders, expose students to meaningful challenges, and strengthen network ties.	
Origin Story	The Dean of Engineering, Jim Nicell, asked me to start an initiative to give more students significant, empowering, hands-on, extra-curricular experience.	
Program Type	Suite of co-curricular engineering leadership programs	
Program Goals	**X Personal development** **X Professional development** Foster industry relationships **X Social impact** Other	
Program elements	**X Co-curricular** Courses Course integration Research Outreach Other	
Target audience	**X Undergraduate students** **X Graduate students** Industry/P.Eng **X Alumni** Other	
Participant access	By Application **X Open to all students by registration** Drop-in Other	
Program status in faculty	Required for graduation **X Elective w formal recog (credit, CCR)** Elective no formal acknowledgement Other	
Learning objectives	**X Learning about oneself** **X Learning to work in teams** **X Learning to navigate org contexts** Learning how actions impact society Other	
Leadership as position/process	Position **X Process** Both Other	
Pedagogy	Theory **X Experiential education** Both Other	
Website	https://www.mcgill.ca/golead/	

Bachelor of Science in Sustainable Design Engineering @ University of Prince Edward Island

Question	Multiple Choice/Summary	Open ended
University	University of Prince Edward Island	
Origin date	September, 2015	
Director	Dr. Nicholas Krouglicof (Dean), Dr. Wayne Peters (Director of Student Experience), Dr. Amy Hsiao (Graduate Studies Coordinator)	
Vision	The Faculty of Sustainable Design Engineering (FSDE) is devoted to developing engineers with exceptional design and professional skills combined with a global perspective; engineers who are broadly capable, globally and socially aware, creative, communicative, and entrepreneurial. Our graduates are ready from day one to provide sustainable solutions to meet the challenges of today's and tomorrow's worlds.	
Mission	Through hands-on experiential learning and teamwork, students develop and grow into engineers with technical and professional skills and the ability to articulate and demonstrate the sustainable impact of engineering, engineering leadership, and engineering design on our future.	
Origin Story	It is increasingly recognized that understanding basic science and mathematics are only two of the many areas that are essential to professional engineering practice. Engineering students in this program must make responsible decisions based on good judgment and an ability to justify decisions within a structured analytical framework. Based on this generalist philosophy, our program is designed to develop a student's ability to think. This fundamental requirement of engineers to think critically in response to ever-changing and complex situations is accomplished through a design stream core which relies heavily on inquiry-based learning supported by traditional lecture-based knowledge. The progression in complex thinking skills occurs over the duration of the four-year program and beyond through appreciation of lifelong learning and professional reflection and development. An integrated stream of project-based design clinic courses through all four-years of the program provides students with the opportunity to develop knowledge, personal and team leadership qualities, and skills through working on real community and industry-based projects. Traditional content courses are delivered through an integrated and timely approach so that professional practice skills are developed in a simulated workplace environment. This program emphasizes design as an essential element of engineering as reflected in the Community Design Program (Year 1), and the Junior Design (Year 2) and Senior Design (Years 3 and 4) Clinics. The program follows current trends in engineering education and focuses on student outcomes. Small class sizes within an activity-based learning environment allow faculty and staff to be student-centric and to provide specific and timely input to students. In addition to fundamental science, engineering science and mathematics courses, students develop skills in sustainability/life cycle assessment, engineering design, communication, analysis, project management, professional ethics, entrepreneurship and personal leadership. The FSDE faculty staff and student culture aims to demonstrate and promote a sustainability mindset, which includes authentic professionalism, technical integrity and personal leadership, and care for solutions that support equality and an inclusive and diverse future.	
Program Type	Degree program (Undergraduate)	
Program Goals	**X Personal development** **X Professional development** **X Foster industry relationships** **X Social impact** **X Other**	Sustainability Mindset as a Global citizen and Engineer
Program elements	Co-curricular **X Courses** **X Course integration** Research **X Outreach** **X Other**	Engineering design team projects that are year-long, in every year of the undergraduate program. Each project is client-based, centered on real-world solutions.
Target audience	**X Undergraduate students** Graduate students **X Industry/P.Eng** **X Alumni** Other	
Participant access	**X By Application**	

	Open to all students by registration Drop-in Other	
Program status in faculty	**X Required for graduation** Elective w formal recog (credit, CCR) Elective no formal acknowledgement Other	
Learning objectives	**X Learning about oneself** **X Learning to work in teams** **X Learning to navigate org contexts** **X Learning how actions impact society** Other	
Leadership as position/process	Position Process **X Both** Other	
Pedagogy	Theory Experiential education **X Both** Other	
Website	www.upei.ca/engineering	

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