

President's Advisory Committee on the Environment, Climate Change, and Sustainability

ANNUAL REPORT 2019: From Vision to Action



June 2019

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Captions and credits for images on front cover - proposed and current living lab projects at U of T (clockwise from top left)

Academic Wood Tower rendering at University of Toronto St. George. Image Credit: MJMA and Patkau Architects

New Science Building at University of Toronto Mississauga. Image Credit: KieranTimberlake

Passive House Residence rendering at University of Toronto Scarborough: Kearns Mancini Architects Inc.

Sidney Smith Commons at University of Toronto St. George. Image Credit: Diana Tyszko

Physical Geography Building at University of Toronto St. George. Image Credit: Entuitive

Campus Farm at University of Toronto Scarborough. Image Credit: Ken Jones

Recreation, Athletics, and Wellness Centre at University of Toronto Mississauga. Image Credit: Scott Norsworthy

A Message from the President

I am pleased to see the publication of the 2019 Annual Report of the President's Advisory Committee on the Environment, Climate Change, and Sustainability (CECCS). Created in 2017, the CECCS has been advancing our understanding of sustainability as embracing environmental and human wellbeing, and the interactions between them. I am particularly happy to see that the committee's focus on integrating operational and academic sustainability is beginning to bear fruit.

The report shares the good news that the foundation has now been laid to meet long-term goals in the three spheres of activity, *campus as a living lab*, *University as agent of change in the community*, and *curriculum innovation*. The report outlines a concrete work plan for promoting sustainability as a core part of the identity of U of T, and for further mobilizing U of T as a global leader in sustainability research, education, operations, and community partnerships.

The CECCS has also been instrumental in developing the new University of Toronto Sustainability website. You can learn more about sustainability at U of T, including details of the committee's work, at www.sustainability.utoronto.ca.

On behalf of the University of Toronto, I congratulate Chair John Robinson and the dedicated members of the CECCS on the 2019 Annual Report and the many achievements it has captured.

Sincerely,

A handwritten signature in black ink, appearing to read "Meric S. Gertler". The signature is fluid and cursive, with the first name being the most prominent.

Meric S. Gertler
President

Executive Summary

In February 2017, the President's Advisory Committee on the Environment, Climate Change, and Sustainability (CECCS) was created with the overall goals to: make sustainability a key component of the University of Toronto (U of T) identity; achieve international leadership in the integration of operational and academic sustainability; and coordinate disparate sustainability activities across the three campuses. During the July 2018 - June 2019 reporting period, the CECCS entered a new stage with the hiring of two full time staff and the approval of the new budget. This was compounded by a donation to the CECCS by a donor to add interns to further pursue CECCS mandate. These developments allowed the CECCS to move to implementation of the approaches and ideas identified in its first 18 months. These ideas have been articulated in the work of the three CECCS subcommittees: Agent of Change in the Community (AOC), Campus as a Living Lab (CLL), and Curriculum Innovation (CI). In the 2018 CECCS Annual Report, a set of specific goals was identified for each subcommittee and the CECCS as a whole. This report provides an initial report on how those goals are being realized.

The Agent of Change (AOC) subcommittee has focussed its efforts on increasing community-engaged learning (CEL) at the University. A workshop was held on May 3rd, 2019, engaging CEL instructors around increasing sustainability CEL courses. A goal identified at the workshop was to form a community of practice for CEL instructors. The workshop also pointed to the need to explore including graduate and professional programs into the CEL work and the need to create sustainability-oriented principles.

The Campus as a Living Lab (CLL) subcommittee has been working to create a charter of principles and get engagement for the six CLL projects (CLL6) that have been approved. The next steps for the subcommittee are to identify the projects and the opportunities for students to work on the CLL6 projects, create guides of how and when to engage students in projects, and form a community of practice for CLL staff and faculty.

The Curriculum Innovation (CI) subcommittee has been developing the three-tiered Sustainability U Framework comprised of: the Sustainability Citizen initiative (acknowledgement of sustainability-related extracurricular activities on the Co-Curricular Record); the Sustainability Scholar initiative (a curricular pathways certificate program); and the Sustainability Leader initiative (Scholar + Citizen + a Capstone course or a CEL course). The focus this past year was on the second tier of the sustainability curricular pathways program at the Faculty of Applied Science & Engineering; Faculty of Architecture, Landscape and Design; Faculty of Arts & Science; University of Toronto Mississauga; and University of Toronto Scarborough. The academic rationale for these certificate programs, including the learning outcomes for the pathways, tied to the respective division's academic plans and course mapping, are being defined for an expected launch in 2020 or 2021.

Planning and Design

(July 1, 2018 - June 1, 2019)

CECCS Goals

In February 2017, the President’s Advisory Committee on the Environment, Climate Change, and Sustainability (CECCS) was created to “to advance coordination of the University’s contributions and objectives pertaining to research and innovation, academic programs, and sustainability initiatives related to our operations”¹. Early in its first year, the CECCS created three subcommittees to explore what we saw as the three priority areas: University as Agent of Change in the Community, Campus as Living Lab, and Curriculum Innovation. Over the period from February 2017 to June 2018, through 21 meetings of the three subcommittees, and the committee as a whole, the CECCS began work in each area, and identified the following priorities, as described in the 2018 Annual Report.

General

- Sustainability as key component of U of T identity
- International leadership in operational and academic sustainability (2)
- Coordination of disparate sustainability activities

Agent of Change (AOC) Subcommittee

- Engage 5,000 students per year on AOC projects in the community (1, 3)
- Develop sustainability-oriented CEL principles (1)
- Sustainability a priority in CEL courses (1,3)

Campus as Living Lab (CLL) Subcommittee

- Engage 1,000 students per year on CLL projects on campus (3)
- Global leadership in sustainability standards (2)
- Signature sustainability projects

Curriculum Innovation (CI) Subcommittee

- Sustainability curriculum pathways for every undergraduate student (3)
- Sustainability community of practice for U of T faculty (3)

The numbers next to the goals denote the alignment with the three Presidential Priorities:

1. Leverage our urban location
2. Strengthen and deepen international partnerships
3. Re-imagine and reinvent undergraduate education

¹ See Appendix 1 for a list of CECCS members.

Overall Planning Activities

From July 2018 to June 2019, the committee completed its planning process, setting the stage for implementation where we engage and invest in our community, put our projects into action, undertake new initiatives, and focus on communication.

During 2017 and 2018, the CECCS was supported by the President's Office, but had no budget of its own. Based on the accomplishments outlined in the CECCS 2018 Annual Report, in December 2018, the President approved a budget for the CECCS, and an extension of its mandate, and the term of the Presidential Advisor and Chair of the CECCS, Professor John Robinson, to the end of 2020. With that approval and budget, the Committee was able to hire two full-time Project Managers, creating an official secretariat for the CECCS. The CECCS also has funding for four student research assistants (RAs) per term for two years.

The presence of new Project Managers, Ayako Ariga and Dione Dias, meant that the role of the CECCS and subcommittees could change from developing plans to undertaking implementation activities and providing strategic guidance. After a four-month hiatus while hiring and staff on-boarding took place, the newly formed secretariat, developed and presented a work plan for each subcommittee, which was subsequently discussed in subcommittee meetings and endorsed by CECCS as a whole by April 2019².

The Expanded Student Engagement (ESE) project, funded by the Faculty of Arts & Science and the Provost's Office from mid 2017 to April 2019 was successfully completed as of Spring 2019. The main focus of the ESE group, comprised of five undergraduate students, included a report on sustainability curricular pathways, and the creation of the following inventories:

- Undergraduate Sustainability Course Inventory
- Co-Curricular Sustainability Activities Inventory
- Community-Engaged Learning (CEL) Sustainability Course Inventory
- Sustainability-Focused Student Groups Inventory

These inventories will be used as tools to develop curricular pathways certificate programs in various divisions facilitated by the Curriculum Innovation subcommittee, and to develop a community of practice of instructors wishing to learn from each other in order to further innovate their courses and to increase their exposure to sustainability-minded students. Nicolas Côté, a member of the ESE group and the RA in the Fall 2018 and Winter 2019 semesters, was instrumental in refining the course inventory towards the creation of a community of practice of sustainability instructors.

Under Professor Robinson's supervision, the ESE group produced an abstract describing their course inventory work and presented it at the International Sustainability Campus Network Annual Conference in Stockholm, Sweden in June 2018. The group also authored a journal article titled "Expanding Student Engagement in Sustainability: Using the Sustainable Development Goal (SDG)- and Community- Engaged Learning (CEL)-Focused Inventories to Transform Curriculum at U of T" which was published in the journal *Sustainability* in January 2019 (See Appendix 3).

² See Appendix 2 for a list of committee and subcommittee meetings held from July 2018 to June 2019.

The need for coherent sustainability messaging and communications has been an ongoing topic of consideration for the CECCS. The President's Office recognized the need to have a unified sustainability website for the university and is putting together a university-wide sustainability website which will include a CECCS section. In parallel, U of T Communications is developing a communications strategy for University sustainability activities. The CECCS is providing inputs for both and facilitating synergy.

Agent of Change (AOC) Subcommittee

The Agent of Change (AOC) subcommittee has identified three goals

- Engage 5,000 students per year on AOC projects in the community
- Develop sustainability-oriented CEL principles
- Sustainability a priority in CEL courses

Community Engaged Learning Sustainability Workshop, May 2019

In support of the AOC goal of engaging 5,000 students a year in AOC projects in the community, a CEL workshop was held on May 3rd. The objective was to engage stakeholders to identify barriers and opportunities in expanding the offering of sustainability-integrated CEL courses.

The workshop, 'Advancing Sustainability in Community Engaged Learning', was co-hosted by the Centre for Community Partnerships (CCP) and the CECCS. Invitations were sent based on a short list of instructors from the CEL sustainability course inventory and spanned a wide range of faculties and departments including the Dalla Lana School of Public Health, Faculty of Arts & Science, Faculty of Applied Science and Engineering, Ontario Institute for Studies in Education, University of Toronto Mississauga (UTM), and University of Toronto Scarborough (UTSC). In addition to the identification of several barriers to teaching and administering sustainability CEL courses, a goal of this workshop was to start to create a community of practice to facilitate knowledge sharing in sustainability-oriented CEL across disciplines. The full report outlining the outcomes and participants of this workshop can be found in Appendix 4. Note that in the 2018 Annual CECCS Report, this workshop was expected to be held in October 2018, but for a variety of reasons was moved to the spring of 2019.

The need to work across the three models of partnership for student engagement noted in previous annual reports was reinforced in the CEL sustainability workshop:

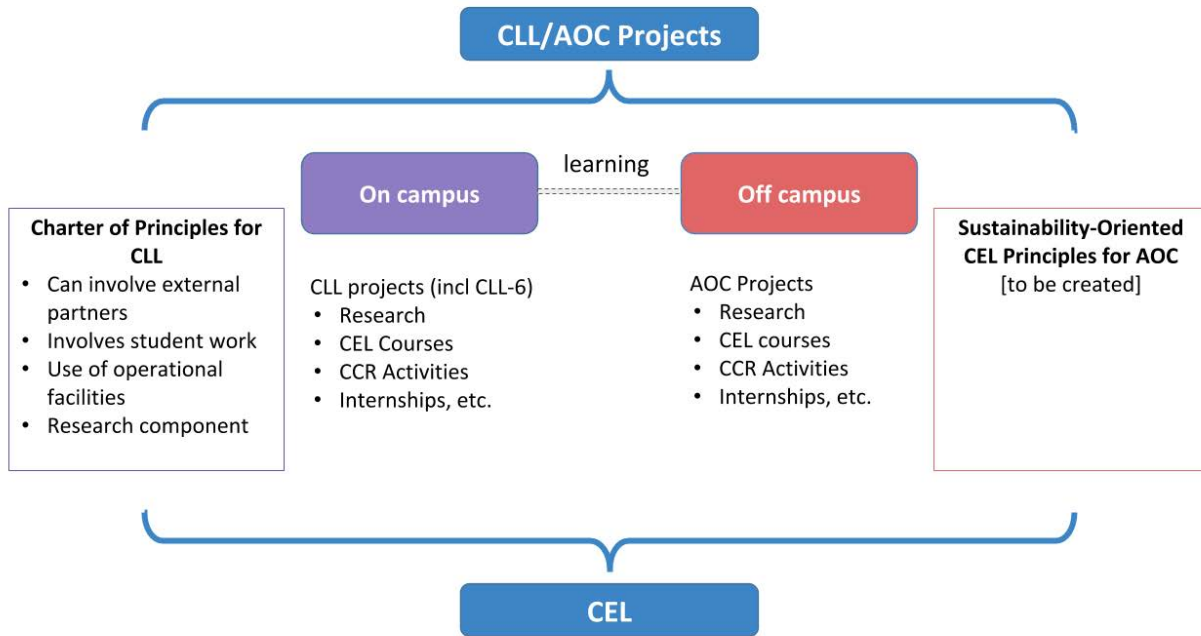
1. Private sector partnerships, where the University works with industry partners on the development of products or services--examples include tech development or incubators.
2. Policy partnerships, where the University works with government agencies and other policy-making bodies--examples include policy analysis or development.
3. Civil society partnerships, where the University works with NGOs, funding councils, Indigenous communities, and other civil society bodies for the purpose of fostering social change.

Sustainability-oriented CEL principles

Our initial plan was to combine a set of principles that defines and guides what Campus as a Living Lab (CLL) and Agent of Change (AOC) projects are, as they were thought to largely be the same. However,

upon creating an initial draft of the CLL principles, it was found that, because AOC projects necessarily involve off-campus partners, the CLL project principles differed from the AOC projects principles and it was best to keep them separate. Therefore, as described below, preliminary CLL principles have been drafted and sustainability-oriented CEL principles for AOC will be drafted after more consultation from the subcommittee and CEL instructors.

The discussion of these principles led us to think through the relationship between AOC and CLL activities and led to the diagram shown here. The student engagement methods and learning components remain similar, while the space where the projects take place and the principles differ.



Campus as a Living Lab (CLL) Subcommittee

The Campus as a Living Lab (CLL) subcommittee focuses on combining operational and academic activities to create student opportunities in the form of living lab projects. The CLL subcommittee met in May 2019, focusing on the six pilot CLL projects (CLL6) identified in the 2018 CECCS Annual Report, and a draft CLL Charter of Principles. The original CLL6 projects have been reviewed and, as discussed further below, a change made in the UTSC retrofit project. It is a priority for the next year to find ways to incorporate student engagement into these retrofit and new build projects on the three campuses. CLL projects will utilize the typology of non-disruptive student involvement in living lab projects outlined in the 2018 Annual Report: Shadow Design, Monitoring and Performance, Design Charrettes, and Study of Process (Meta-process).

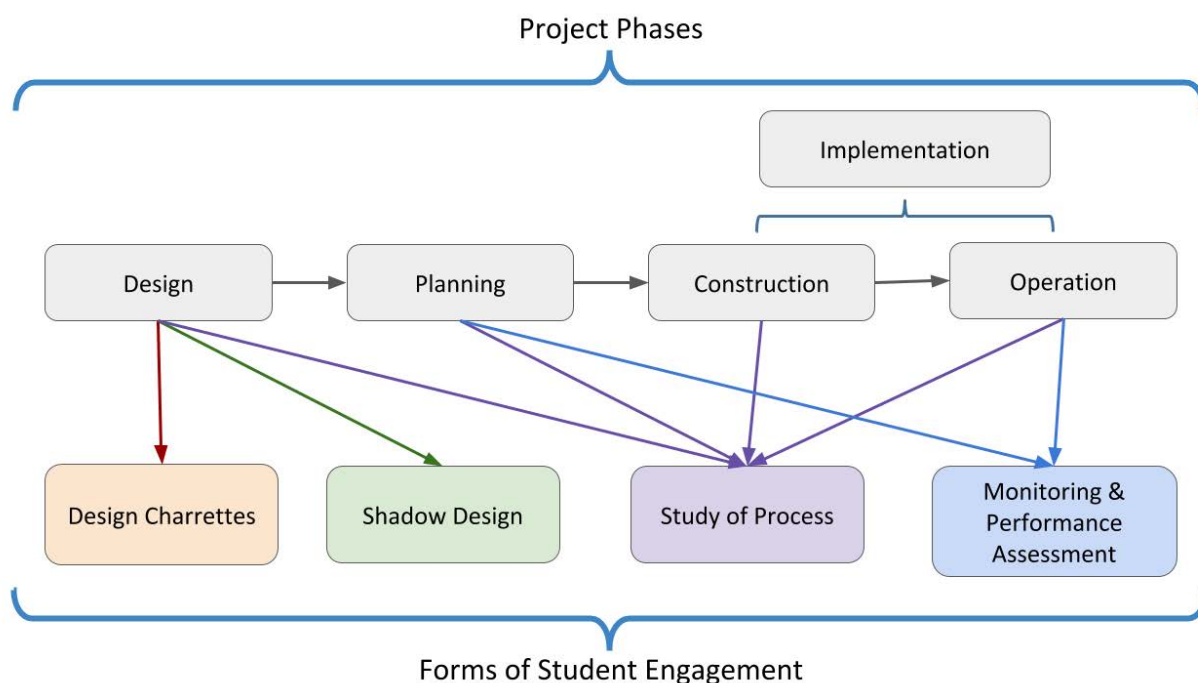
Shadow design takes place in the design phase of a project. It is the process of non-disruptive work that involves the sharing of technical documents and project information for use in parallel design exercises. These do not affect the critical path of the project but some outcomes could be incorporated into the project.

Monitoring and performance assessment take place in the construction and operation phases of projects and include items like pre- and post-occupancy evaluations and energy models. The University's Sustainable Built Environment Performance Assessment (SBEPA) research network will continue to provide guidance for this engagement. The SBEPA group is developing a funding application to instrument the CLL6 projects to support monitoring and assessment work.

Design charrettes are workshops intended to add sustainable design ideas at the beginning of the project planning phase.

Study of Process (meta-process) uses participant-observation techniques to study U of T's design, planning and implementation processes. These studies could lead to ideas to inform future projects and, in the process, students learn how actual project decisions are made and how constraints are navigated.

This diagram demonstrates how student engagement could occur within the phases of a project.



Campus as a Living Lab Charter of Principles

The concept of a living lab project is used at a number of institutions. The Committee created and adopted a set of guiding principles to help select living lab projects by defining what a 'living lab project' is for the University, regardless of the project's location in the University, the type of client involved, or the student, staff, or faculty involvement.

Four defining elements to a Campus as a Living Lab project are identified as:

- integrating core learning and research mission with campus operations

- involving financially responsible use of U of T infrastructure for demonstration of and research on leading edge solutions (technical and social)
- engaging researchers, students, faculty, instructors, operations staff, and potentially external partners
- having potential for knowledge transfer within and beyond U of T

The objectives of Campus as a Living Lab projects are to:

- Create sustainable solutions where innovations selected for implementation must be ecologically and socially sustainable, financially self-sufficient, and supportable in the long term by campus operations and the campus community
- Develop research, innovation, and collaboration opportunities in the form of new technologies, techniques and solutions in partnership with others
- Look for integrated solutions to employ campus-wide perspective, focusing on connections between physical systems (energy, water, material, food) and the well-being of campus community
- Provide learning opportunities for students and faculty to involve campus community members from a broad range of disciplines in the innovation process
- Be inclusive and contributory to work for mutual benefit with a broad range of U of T community members and possible external partners

The factors that would make for successful Campus as a Living Lab projects are:

- Strong research, teaching & learning outcomes
- Identified operational needs
- Committed and motivated partners
- Student participation
- Effective project management
- Open communication
- Access to funding

CLL Projects with External Partners

Universities are in the unique position to work with external partners to research new technologies and ideas on campus. These CLL projects with external partners must be consistent with the elements and objectives of CLL projects mentioned above and adhere to the following principles:

- be time-limited research projects
- have a research dimension
- provide funding for students
- agree to rights to publish and the university's standard Intellectual Property (IP) rights

For the cases where external partners are involved, whether initiated by the external partner or a U of T researcher, the CLL subcommittee, through the secretariat, will ensure the inclusion of both research and operational involvement, and bring the projects to the CLL subcommittee for their input.

Note that these steps should only be followed if U of T is not paying for a good or service. If U of T is paying for a good or service, the normal procurement process, involving public tenders as appropriate,

must be followed.

CLL Project Governance

The CLL subcommittee (on behalf of the CECCS) is responsible for coordinating CLL projects; such coordination is needed for working effectively with operational procedures, and identifying teaching and research opportunities. Logistics for the exact process are yet to be determined.

Campus as a Living Lab Projects (CLL6)

The Campus as a Living Lab subcommittee aims to bring together University operations and academics to work on projects with students. Six Campus as a Living Lab (CLL6) projects have been chosen as pilots. One new build and one retrofit project was chosen on each of the three campuses. There has been a slight change in projects since the 2018 Annual Report. The retrofit project at UTSC will now be the campus farm instead of the geothermal field.

Location	New Project	Retrofit Project
UTSC	Passive house residence	Campus Farm
St. George	Academic Tower	Physical Geography building
UTM	Science building	Recreation, Athletics, and Wellness Centre

Passive House Residence (UTSC)

A 750 bed student residence will be built to passive house standards with some active house elements. Currently in the design phase, construction procurement will take place in October with the building set to be completed in April 2022. There are three potential projects to engage students in this building. First would be a monitoring process in the Summer or Fall. The second project would be recommending points of connection with occupants, where occupants can connect and engage with the building. This could be in the form of creating information sessions for occupants and communication material to engage occupants. The third project would be a post-occupancy survey to gauge the occupants experience with a passive house residence.

Campus Farm (UTSC)

There is a large farm space currently being used by the campus community at the UTSC campus. The space is also used as a test bed for research by a variety of departments at UTSC. A campus farm coordinator has been hired to coordinate farm efforts and as the campus farm currently already acts as a living lab for a number of projects, these efforts will be recorded and new project opportunities will be sought in conjunction with the CECCS and the new campus farm coordinator.

Academic Wood Tower (UTSG)

The Academic Wood Tower will be the tallest wood and concrete hybrid tower in North America. The choice to use mass timber instead of traditional concrete alone was because of economic, wellness, and environmental benefits, and is made possible by the availability of government incentives. The project is still in the design phase and we hope to involve students in building a Virtual Design and Construction Model for the Tower. Once this project enters the construction phase, a study of process as a living lab

project should become possible. There is potential for further student engagement with this project and such new engagement opportunities will be discussed as the project progresses.

Physical Geography Building (UTSG)

The Physical Geography building is a 3-storey office building built on the St George campus in 1926. It is due for a retrofit and the plan is to make it net zero in energy terms. External consultants conducted a building performance evaluation and submitted a proposal on how to achieve net zero in the retrofit. Living lab activities have already begun as, in the fall of 2018, students in the ENV 461/1103 living lab course undertook a Pre-Occupancy Evaluation of human well being in the existing building. As the post-retrofit building occupants are yet to be determined the retrofit timeline is uncertain. In the interim, students will review the building performance and proposal from the external consultants and utilize the design charrette process to propose ideas as to how to achieve net zero energy goals, review the potential for net zero carbon, possible net positive human wellbeing, and accessibility standards for this building. Once the project proceeds, there will be more opportunity to engage students in this retrofit.

Science Building (UTM)

The Science Building is a new building that will begin construction on the UTM campus in the Summer of 2019 and take 2 years to complete. The building will include a geothermal system (to be installed underneath the building) and a solar PV array. It will be 4 storeys tall (plus a basement and mechanical penthouse), will have a gross floor area of 14,102 square meters, and will be certified to LEED silver or better. The student engagement for this project in 2019 will be to complete an energy model using the software specified in order to compare what the building was designed to save with the actual savings when the building is completed. There is further potential for CLL projects in the future.

Recreation, Athletics, and Wellness Centre (UTM)

RAWC (Recreation, Athletics, and Wellness Centre) is a 2005 building of 7,600 gross square meters on the UTM campus that will be retrofitted with a solar thermal system for pool heating, domestic hot water and a replacement of the existing boilers. Currently there are four CLL projects to engage students within this building. Two projects will be a pre-occupancy evaluation and energy modeling in the Summer of 2019 before all the retrofits are completed. The other two projects will be a post-occupancy survey and energy modeling after the retrofits are completed in Fall 2019 or Winter 2020.

Campus as Living Lab of Sustainability Course

Professor Robinson teaches ENV 461/1103 'The U of T Campus as a Living Lab of Sustainability'. Each year the course engages undergraduate and graduate students in CLL projects proposed by operational staff at the University. In the Fall of 2018, students undertook six projects*:

- A water conservation project at Trinity College in the form of a rainwater harvesting proposal for the rooftop garden at North Munk - for Trinity College
- A post-occupancy evaluation of the Sidney Smith Student Commons - for the Faculty of Arts & Science
- An evaluation of the Huron-Sussex laneway housing and the potential for making it a net-positive community - for Space & Facilities Planning
- A pre-occupancy evaluation of the Physical Geography Building before a net zero energy retrofit - for Facilities & Services
- A sustainability engagement plan - for the Sustainability Office, St. George Campus

- A comparison of sustainability building design standards - for Space & Facilities Planning

*These projects can be found on the St. George Sustainability Office's website:

<https://uoft.me/LivingLab>

Curriculum Innovation (CI) Subcommittee

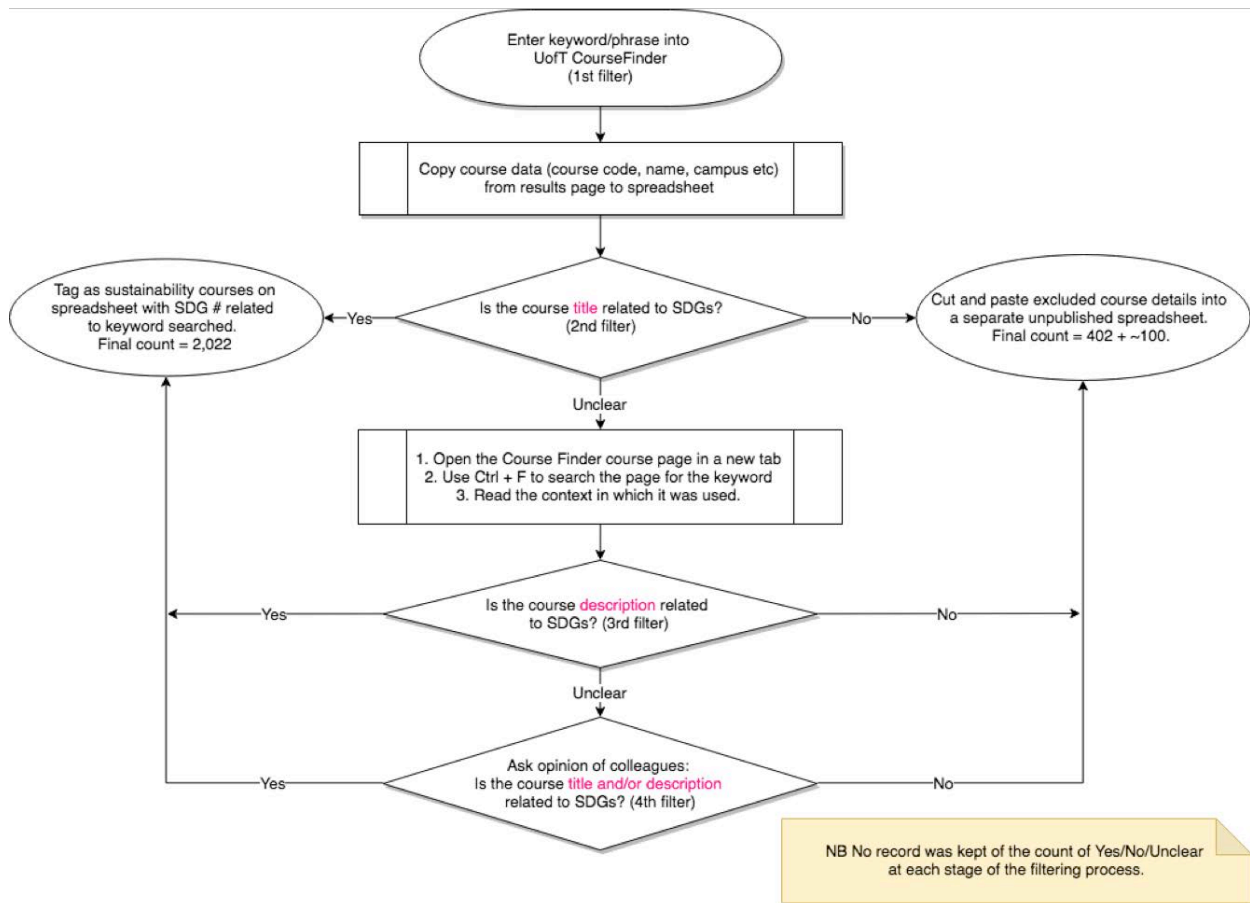
The Curriculum Innovation (CI) subcommittee's central priority is to support the development of sustainability curriculum pathways for undergraduate students on the three campuses. Pathways are clusters of courses with a common theme of sustainability that allow students to study that theme from various disciplinary and methodological perspectives. Pathways add integrated sustainability content to a student's degree program, and can be helpful in understanding interconnectedness, relationships, and complexities among ideas that would otherwise not be readily realized in that degree. Sustainability curricular pathways would provide each undergraduate student with an opportunity to add sustainability learning to their degree no matter what program(s) they are enrolled in, and to develop cross-cutting interdisciplinary skills.

Designated CECCS faculty members have been spearheading this work in the Faculty of Applied Science & Engineering; Faculty of Architecture, Landscape and Design; Faculty of Arts & Science; UTM and UTSC.

We propose to develop a three-level Sustainability U Framework, modeled after Professor Joseph Wong's Global U Framework:

- Sustainability Scholar initiative (Sustainability curricular pathways certificate program)
- Sustainability Citizen initiative (Acknowledgement of sustainability-related extracurricular activities on Co-Curricular Record (CCR))
- Sustainability Leader initiative (Scholar + Citizen + a Capstone course or a CEL course)

The inventories of sustainability-related courses and CEL opportunities (in courses and co-curricular activities) developed by the ESE group last year are central to the building of these sustainability pathways. The course inventory is a comprehensive database of almost all undergraduate sustainability courses at U of T. The inventory includes 2,022 sustainability-oriented courses, representing approximately one-quarter of all undergraduate courses. The inventory is based on keywords derived from the United Nations Sustainable Development Goals (SDGs). The SDGs were chosen as a basis for the inventory due to their comprehensiveness and widespread use in the sustainability field. The flow chart below depicts the course search process.



Flowchart of U of T undergraduate 2018-2019 Sustainability Course Inventory Construction, created by Jen Crothers, Data Manager, UBC Sustainability Initiative

Faculty of Arts & Science

At the Faculty of Arts & Science (FAS), under the leadership of Professor Steve Easterbrook, Director of the School of the Environment and CECCS member, learning outcomes for the pathways are being discussed. Once confirmed, inventory courses will be identified from the comprehensive inventory of all undergraduate courses with sustainability content and their instructors that the ESE group created last year. 844 of the 2,022 sustainability-oriented courses in 2018-19 in the inventory were FAS courses. The courses will be selected and necessarily sequenced to support achievement of the learning outcomes, and to allow students to satisfy most, if not all, of the FAS' Breadth Requirement³. Conversations with faculty in units that offer the inventory courses will ensure that there is capacity to support the pathways and will further support a community of practice around sustainability in the FAS.

University of Toronto Mississauga

University of Toronto Mississauga (UTM) is at an advanced stage in planning sustainability pathways, which is in alignment with their Academic Plan, with strong support from the Dean. The Sustainability Pathways Certificate initiative will be presented to the UTM Academic Affairs Committee November 2019 and is expected to launch in May 2020. Professor Shashi Kant, Director, Master of Science in Sustainability Management Program at UTM, and CECCS member, is taking the lead in designing the Sustainability Certificate, which will be made available UTM-wide.

On Oct 16-18, 2019, UTM will host the "International Conference on Sustainability: Transdisciplinary Theory, Practice, and Action". This inaugural conference seeks to bring together academics and students across all disciplines, Indigenous leaders and scholars, business executives, civil society, policymakers, and sustainability professionals to explore innovative forms of theory, practice, and action that can help craft a path towards sustainability. See Appendix 5 for more details of the conference.

Faculty of Applied Science and Engineering

The Faculty of Applied Science and Engineering (FASE) already has multiple Minor and Certificate programs with Sustainability content, such as the Advanced Manufacturing Minor, Environmental Engineering Minor, Sustainable Energy Minor, Renewable Resources Engineering Certificate, among others. Professor Bryan Karney, Associate Dean, Cross-Disciplinary Programs and CECCS member, will be reviewing the existing offerings and confirming which ones FASE would like to count under the sustainability pathways certificate umbrella.

³ The FAS has a multidisciplinary requirement called the Breadth Requirement to ensure all students graduating with a degree from the FAS have chosen courses across a broad range of subject areas in the Faculty as part of their undergraduate education. The five Breadth Requirement Categories are: 1) Creative and Cultural Representations; 2) Thought, Belief, and Behaviour; 3) Society and Its Institutions; 4) Living Things and Their Environment; and 5) The Physical and Mathematical Universes. The Breadth Requirement can be completed in one of two ways:

- at least 1.0 full course equivalent (FCE) in each of 4 of the 5 categories, or
- at least 1.0 full course equivalent (FCE) in each of any 3 of the 5 categories, and at least 0.5 FCE in each of the other 2 categories.

More details can be found at <https://fas.calendar.utoronto.ca/hbahbsc-requirements#breadth-requirement>.

Faculty of Architecture, Landscape, and Design

Professor Liat Margolis, a member of CECCS, and the Associate Dean, Academic, will lead the pathways program development for their undergraduate program, and have started mapping their courses with sustainability content. The Faculty of Architecture, Landscape, and Design and the School of the Environment have jointly hired a new faculty member in Sustainable Built Environments, who started in January 2019.

University of Toronto Scarborough

At the University of Toronto Scarborough (UTSC), their pathways working group is expanding, with the addition of a faculty member who will be advising the Dean on the structure of the pathways at UTSC and will teach an introductory course that provides an introduction to all of the questions and concepts that will be explored in the pathways certificate. This course will serve as the core course for the certificate once it has been developed.

Community of Practice of Instructors

In addition to developing sustainability curricular pathways open to all undergraduate students, the CI subcommittee is using the sustainability course inventory as a tool to create a community of practice of sustainability instructors. As a first step, we will be conducting a survey asking faculty members to confirm if they are offering the identified courses in 2019-20 and if they would be interested in being part of the community of practice for future communications and network development events.

New Initiatives

The CECCS received a donation of \$100,000 to create the Adams Sustainability Champion Internships. The donor, Wendy Adams, wishes for the fund to be expended on new summer internship positions. These internships provide outstanding students or recent graduates (undergraduate or graduate) with an opportunity to contribute to sustainability in a powerful way. The goal is to leverage them as future leaders in sustainability and to promote important knowledge dissemination and exchange. The chosen interns are employed in the summer to work full-time on CLL projects and tasks supporting the CECCS, and to travel to another university with a strong sustainability focus to build links, study their practices, and share ideas between the two universities. Utrecht University in the Netherlands and the University of Edinburgh in the United Kingdom have agreed to host two intern visits in the summer of 2019. Interns will produce a report and give a presentation summarizing the outcomes of their work. They will also be encouraged to share their experiences through social media in order to reach a wider audience.

The Tri-Campus Sustainability Innovation Prize, formerly known as the Clean Tech Challenge, has been turned into a more encompassing sustainability prize based on CECCS feedback. This initiative is led by the Innovation and Partnership Office (IPO) under the Office of the Vice-President, Research & Innovation, headed by Dr. Derek Newton, CECCS member and the Assistant Vice-President, Innovation, Partnerships and Entrepreneurship. Student-led ideas, projects, and startups were invited to compete for a chance to pitch in front of a live judging panel to be selected for three \$5,000 prizes to further develop their idea. The prizes were announced at the competition event held in ONRamp in June 2019. The details and the finalists on the short list can be found in Appendix 6.

Links with Other Universities

In October 2017, U of T joined the Global Research Alliance on Sustainable Finance and Investment (GRASFI) at the invitation of Oxford University. As Presidential Advisor on the Environment, Climate Change and Sustainability, and Chair of CECCS, Professor Robinson was designated as the U of T Lead for GRASFI. Since 2017, we have developed a strong relationship with the School of the Environment's Environmental Finance Advisory Committee, culminating in a conference on carbon markets and finance at U of T in June 2018, the program of which was contained as an appendix in the 2018 CECCS Annual Report. Since that conference, with the aid of Professor Kenneth Corts, CECCS member and Vice-Dean, Faculty & Research at the Rotman School of Management, we have built stronger relationships with colleagues at Rotman, culminating in a research workshop on sustainable finance and investment in April 2019 (see Appendix 7). The longer term goal is to support the development of increased faculty resources at U of T in sustainable finance and investment, with strong linkages to the practitioner sector.

In February 2018, U of T joined the University Climate Change Coalition (UC3), a new coalition of leading North American research universities, founded by the University of California, that will prototype a collaborative model designed to help local communities achieve their climate goals and accelerate the transition to a low-carbon future. UC3 has grown to 19 institutions, which are mobilizing their resources and expertise to accelerate local and regional climate action in partnership with businesses, cities and states. Professor Robinson will be attending the UC3 meeting to be held at UBC in July 2019.

We are honoured to partner and share our expertise with leading global universities both in Canada and abroad. In 2018-19, for example, the president of Utrecht University visited U of T, had a tour of several living lab projects, and observed the way sustainability initiatives are incorporated in teaching and operations. Professor Robinson has met several times with the senior management team at the university to advise on development of the sustainability curricular pathways initiative and CLL projects at Utrecht. During 2019 Professor Robinson will be Visiting Professor on Transdisciplinary Sustainability at Utrecht University, working on supporting research and living lab projects at Utrecht.

In January 2019, Professor Robinson was asked to give a keynote address on universities and sustainability at a student-led sustainability conference at Queen's University in Canada. The students there have created a committee to pursue sustainability initiatives as at U of T, with representatives from faculty and operations staff. During the last several years, Professor Robinson has given similar talks at the University of Edinburgh in the UK, Copenhagen Business School, Université Libre de Bruxelles, Luxembourg University, and Chalmers University of Technology in Sweden. In return, we have gained a deeper understanding of both the similar and different challenges faced by universities around the world of incorporating sustainability in their teaching, research, operations and partnerships. We remain committed to developing these partnerships and to making an impact.

Implementation

(June 2019 - December 2020)

Building on the activities outlined in the previous section, the period from June 2019 to the end of 2020 will be an accelerated process of implementation of our goals. What follows is a brief outline of our plans.

Agent of Change (AOC) Subcommittee

At a meeting in March 2019, the AOC subcommittee endorsed the plan for the coming year, which includes building a community of practice for community-engaged learning (CEL) instructors and staff and inventorying graduate and professional programs that have community engagement initiatives.

May to August 2019

The next steps for the AOC subcommittee will be to plan a larger event to engage more instructors, and possibly community partners and students. A major goal for this event will be to obtain feedback on our plans and actions aimed at creation of a community of practice of community engaged learning instructors at the University.

In the CEL sustainability workshop held on May 3rd, instructors not currently teaching CEL were not consulted. In order to better understand how to expand the number of CEL courses offered, it is important for the CECCS to hear from some instructors who are not currently teaching CEL in order to understand the barriers from their perspective.

A plan to inventory the types of community engaged learning in professional and graduate programs will be another next step in order to better understand the types of student engagement that already exist with these programs and ways to incorporate sustainability into them. These programs could include placements in hospitals, private sector, and government that are outside of the courses in the community engaged learning course inventory. These placements are often program requirements and could be fairly long and impactful engagement in the community.

Much of the work around CEL has occurred with the Centre for Community Partnerships (CCP). The recent decision to combine Career Exploration & Education and the CCP into one portfolio, Career & Experiential Learning, will result in fostering some new connections with the new director and associate director. The sustainability-oriented CEL principles will be created in partnership with Career Exploration & Education.

September to December 2019

An AOC subcommittee meeting will be held during this time. A community of practice event, which was proposed at the CEL sustainability workshop, will be held. A plan for the community of practice for CEL will be presented at this event. A proposal for including the graduate and professional programs into AOC will be created based on the inventory created in the previous term. The possibility of a one-stop-shop for AOC opportunities and course offerings will be explored.

January to April 2020

An AOC subcommittee meeting will be held in late April. The community of practice will be further developed to expand AOC offerings. The one-stop shop for AOC opportunities will be reviewed by the AOC subcommittee. The sustainability-oriented CEL principles will be disseminated to the community of practice for CEL.

May to June 2020

The sustainability-oriented CEL principles will be used to inventory the number and variety of student opportunities in the community. The progress of the AOC subcommittee will be measured against the AOC goals.

Campus as a Living Lab (CLL) Subcommittee

The CLL subcommittee endorsed a plan for the coming year at the April 2019 subcommittee meeting. The plan includes setting up project processes for engaging students, the creation of new CLL projects, and the inventorying of new and existing CLL projects.

May to August 2019

The timelines and processes for a typical project at the University will be recorded and possible student engagement (design charrettes, shadow design, study of process, and monitoring and performance assessment) will be integrated with these timelines in order to best determine how to create CLL projects. The projects for the CLL course will be sought out and clients solidified for the Fall semester. The CLL Charter of Principles will be tested using example projects found from the inventory. The Charter of Principles will be adapted with the findings from this exercise. The planning of the CLL6 projects will occur during this time for the Fall semester. The method of engaging students - whether in courses or student clubs, the research component, and the operation contacts - will be determined.

A plan for the dissemination of the CLL Charter of Principles will be created in order to engage with more stakeholders on campus who could, or are currently working on, CLL projects. This will act as an introductory tool to engage with these stakeholders and also provide some consistency and guidance on what a living lab project is. From this engagement, an inventory of past, present, and future projects will be created and maintained to measure progress toward the goal of engaging 1,000 students in CLL projects.

A guide for ways to engage students in CLL projects will be created, whether through courses, student groups, or independent research projects. This guide will predominantly be used by the CECCS to connect operations and academics to create CLL projects, as outlined in the CLL Charter of Principles. This inventory will be used to map project timelines in order to determine what type of projects are better suited to what type of student engagement. For example, pre and post-occupancy evaluations on retrofit projects are best suited to be part of one semester long course.

September to December 2019

A CLL subcommittee meeting will be held in this time to go over the CLL6 projects, review the final CLL Charter of Principles, and the phases of projects with student engagement methods. Based on the

feedback from the subcommittee, these components will be disseminated to those identified as working on CLL projects. The CLL course projects will take place during this time. The Fall CLL6 projects will take place and there will be a review of the Summer projects and a debrief on how they went. Winter CLL projects will be established and students and project teams will be chosen.

January to April 2020

Another CLL subcommittee meeting will be held towards the end of April. A network of faculty members interested in teaching CLL courses and staff will be created with the use of the CLL inventory. This will be the community of practice for CLL. More CLL projects will be developed. There will be a debrief of the Fall projects, Winter CLL6 projects will take place and Summer CLL projects will be established.

May to June 2020

A review of the past CLL projects will take place during this time. The progress of the CLL subcommittee will be measured against the CLL goals. Summer CLL projects will take place and Fall CLL projects will be planned.

Curriculum Innovation (CI) Subcommittee

As endorsed in the Subcommittee meeting held in April 2019, we will allocate CECCS resources to support the Sustainability U framework development and respective governance processes as detailed in the work plan below at the Faculties of Applied Science & Engineering, Architecture, Landscape and Design, and Arts & Science, and UTM and UTSC.

April to December 2019

We will spend the remainder of 2019 conducting research for and supporting the development of the Sustainability Scholar program in consultation with the Vice- and/or Associate-Deans, Department Chairs and Academic Directors, and Registrar's Offices at the divisions. The plan is to involve the student unions and the Dean's consultative groups that may be able to facilitate the consultation process with the interested students. Shamaila Bajwah, the student representative on the CECCS, and the CECCS RAs will work on this as well. We will also seek guidance from the Office of the Vice-Provost, Academic Programs (VPAP). VPAP is represented on the CECCS by Dr. Daniella Mallinick, Director of Academic Programs, Planning, and Quality Assurance.

The Scholar program development work includes the definition of the certificate-specific learning outcomes for each division and a clear logic to course selection to achieve those outcomes. Also involved are the determination of the mechanism for assessing student performance in relation to the learning outcomes, alignment of the pathway with the Faculty/Division's Academic Plan and, if available, the recommendations arising from cyclical reviews of the Faculty/Department.

Concurrently, we will be working with Student Life on the Sustainability Citizen program design. The Co-Curricular Records (CCR) inventory created by the ESE group has identified 200+ CCR opportunities. We will work with Student Life to establish a process by which these opportunities can be advertised, tracked, and acknowledged as a Sustainability Citizen offering.

The third tier of the Sustainability U framework is the Sustainability Leader program. It will be the combination of the Sustainability Scholar and Citizen programs, topped with a CEL or a Capstone course. This tier, which would be offered to students seeking a high level of curricular and co-curricular engagement with sustainability concepts and practices is still provisional in nature and will be developed once the details of the Scholar and Citizen offerings are confirmed.

January to March 2020

The Sustainability pathways certificate program is expected to obtain Faculty approval through the governance process in each division, which in most cases will be through the Undergraduate Curriculum Committee and then the Campus or Faculty Council. When approved, Faculties/Divisions will submit the proposals to the VPAP Office for inclusion in the annual report on certificates. They will also ensure that the offerings are properly coded in ROSI to allow for reporting.

April 2020

VPAP's reporting deadline to University governance is in April. The Sustainability Pathways Certificate Program will then be made available in Acorn and Degree Explorer. The divisions will notify their students of the new certificates.

September 2020

The Sustainability Scholar and Sustainability Citizen programs will be launched. The Sustainability Leader program will aim for soft launch in 2020 at one or two divisions and full launch in 2021.

In addition, we will develop a strategy to develop a community of practice of sustainability instructors. We will be mindful of the instructors who are not aware that they are teaching a course with sustainability content as defined by the SDGs. An effective strategy on developing awareness, bringing together instructors of various background to make cross-disciplinary connections and learning from each other will be explored and documented for implementation.

ECCS Committee

In 2018-19, U of T was approached by several ranking or rating systems for participation. One of them was the Times Higher Education (THE)'s new University Impact Rankings using SDGs. While the CECCS was not involved in the data collection or submission process, U of T participated and ranked 31st of 462 participating institutions. The decision whether to participate in the next round is pending, but if we are, the CECCS will make a more significant contribution.

We are also exploring the potential for U of T's participation in the Sustainability Tracking, Assessment & Rating System (STARS) of the Association for the Advancement of Sustainability in Higher Education (AASHE). STARS is a transparent, self-reporting framework for colleges and universities to measure their sustainability performance. There are 800 participating institutions in 30 countries. While data collection and analysis process is expected to be labour-intensive, the benefits include engaging students, staff, and faculty in the reporting process, building a culture of sustainability on campus, and identifying new ideas and best practices to implement at U of T. We will conduct a comparative analysis of the THE University Impact Ranking and STARS that will determine whether the data collection and research efforts overlap for the two rankings and then make a recommendation to the CECCS and U of T's senior leadership on whether U of T should participate.

As part of the University Climate Change Coalition (UC3), U of T conducted a mapping exercise to identify the University's climate research assets. The UC3 Climate Research Assets database is meant to increase transparency and collaboration among the member universities. A wide range of climate change related assets like courses, institutes, centres, departments, programs, projects groups, labs, and subject matter experts were identified and submitted to the database. The Assets of all UC3 members will be available for view on the 'Coalition Asset Mapping Dashboard.' Assets can continually be submitted to UC3 for inclusion as new or missing assets are found via the Dashboard:
<https://public.tableau.com/views/UniversityClimateChangeCoalitionUC3/UC3Assets?:showVizHome=no>

Communications and engagement are important aspects of the CECCS' work. As a way to engage with the University community on our vision for making sustainability a part of U of T's core identity, and integrating and featuring the diverse sustainability-related activities across campuses, the CECCS is supporting the President's office as they put together a unified sustainability website for the University. We are also working with the U of T Communications on the development of a sustainability communications strategy in order to ensure consistent and articulate messaging.

Conclusion - Beyond 2020

We are excited to be entering a new implementation phase of our activities and grateful that we have been given the resources to make this possible. We are also impressed by the strong support we have been given from the faculty, staff and students with whom we are working. U of T is a powerhouse of excellent research, teaching and operations related to sustainability, as it is in many other fields, and it is our privilege to be able to build on those strengths. The ultimate goal is to integrate and add to those strengths such that sustainability becomes a key part of the identity of the university, and the University of Toronto is seen as both a local and global leader in sustainability.

Appendices

Appendix 1 - Membership

Appendix 2 - Meetings

Appendix 3 - Expanded Student Engagement (ESE) Journal Article

Appendix 4 - CEL sustainability workshop report (May 3, 2019)

Appendix 5 - Sustainability: Transdisciplinary Theory, Practice, and Action (STTPA) Conference (October 16-18, 2019)

Appendix 6 - Tri-Campus Sustainability innovation Prize (June 12, 2019)

Appendix 7 - Sustainable Finance Research Roundtable (April 10, 2019)

Appendix 1 - Membership

Name	Title / Affiliation	Type
John Robinson	Professor, Presidential Advisor on the Environment, Climate Change, and Sustainability	Chair
Conor Anderson	PhD candidate, University of Toronto Scarborough	Student
Shamaila Bajwah	Undergraduate student, Faculty of Arts & Science	Student
Maria Banda	Graham Fellow, Faculty of Law	Alumni
Aimy Bazylak	Associate Professor and Director, Institute for Sustainable Energy, Faculty of Applied Science & Engineering	Faculty
Kenneth Corts	Professor and Vice-Dean, Faculty & Research, Rotman School of Management	Faculty
Gilbert Delgado	Chief, University Planning, Design & Construction, Office of the Vice-President, Operations and Real Estate Partnerships	Staff
Steve Easterbrook	Professor and Director, School of the Environment	Faculty
Shashi Kant	Professor and Director, Master of Science in Sustainability Management Program, University of Toronto Mississauga	Faculty
Bryan Karney	Professor and Associate Dean, Cross-Disciplinary Programs, Faculty of Applied Science & Engineering	Faculty

Tim Lang	Manager, Sustainability Office, University of Toronto Scarborough	Staff
Daniella Mallinick	Director, Academic Programs, Planning & Quality Assurance, Office of the Vice-Provost, Academic Programs	VP Liaison
Liat Margolis	Professor, Associate Dean, Research, and Director, Green Roof Innovation Testing Laboratory, Faculty of Architecture, Landscape, and Design	Faculty
Fiona Miller	Professor and Chair in Health Management Strategies, Institute of Health Policy, Management and Evaluation, Dalla Lana School of Public Health	Faculty
Jennifer Murphy	Professor and Associate Chair, Graduate Studies, Department of Chemistry, Faculty of Arts & Science	Faculty
Derek Newton	Assistant Vice-President, Innovation, Partnerships and Entrepreneurship	VP Liaison
Ron Saporta	Chief Operations Officer, Property Services & Sustainability	VP Liaison
Ayako Ariga	Project Manager: Curriculum Innovation, and Secretariat, CECCS	
Dione Dias	Project Manager: Agent of Change and Campus as a Living Lab, CECCS	
Additional Subcommittee Members		
Ahmed Azhari	Director, Utilities, Sustainability & Grounds, University of Toronto Mississauga	Staff

Susannah Bunce	Professor, Department of Human Geography, University of Toronto Scarborough	Faculty
Paul Leitch	Director of Sustainability, Facilities and Services, St. George	Staff
Jeff Miller	Director, Facilities Management, University of Toronto Scarborough	Staff
Claire Westgate	Placement & Employer Relations Officer, MScSM Program, University of Toronto Mississauga	Staff

Subcommittees

AGENT OF CHANGE IN THE COMMUNITY
<p>Susannah Bunce Tim Lang Fiona Miller Jennifer Murphy Derek Newton Claire Westgate John Robinson Dione Dias</p>

CAMPUS AS LIVING LAB
<p>Ahmed Azhari Maria Banda Aimy Bazylak Ken Corts Gilbert Delgado</p>

Tim Lang
Paul Leitch
Jeff Miller
Ron Saporta
John Robinson
Dione Dias

CURRICULUM INNOVATION

Conor Anderson
Shamaila Bajwah
Steve Easterbrook
Shashi Kant
Bryan Karney
Liat Margolis
Daniella Mallinick
John Robinson
Ayako Ariga

Appendix 2 - Meetings (July 2018 - June 2019)

Committee on the Environment, Climate Change, and Sustainability (CECCS)

- May 6, 2019

Agent of Change (AOC) Subcommittee

- November 21, 2018
- March 29, 2019

Campus as a Living Lab (CLL) Subcommittee

- November 26, 2018
- April 1, 2019

Curriculum Innovation (CI) Subcommittee

- November 28, 2018
- April 4, 2019

Article

Expanding Student Engagement in Sustainability: Using SDG- and CEL-Focused Inventories to Transform Curriculum at the University of Toronto

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Abstract: The Expanded Student Engagement Project (ESE) has developed three comprehensive inventories which aim to increase student knowledge of sustainability-related course content and increase student engagement in on- and off-campus, curricular, and non-curricular sustainability projects at the University of Toronto (U of T). The first is a sustainability course inventory (SCI) generated using keyword search based on the UN Sustainable Development Goals (SDGs). This is the first SCI that has been based on the SDGs. The inventory identified 2022 unique sustainability courses and found that SDG 13 had the greatest representation and SDG 6 had the least. The second inventory is a community-engaged learning (CEL) sustainability inventory which found 154 sustainability-focused CEL courses and identified 86 faculty members who teach sustainability CEL. Finally, an inventory of sustainability co-curricular and extracurricular opportunities revealed that U of T has 67 sustainability-focused student groups and identified 263 sustainability-focused opportunities. These inventories are an important foundation for future initiatives to increase student engagement in sustainability on campus and in the community. The ESE will integrate this data into U of T's course management system and use the inventories to develop a new sustainability pathways program.

Keywords: sustainable development goals; SDGs; higher education institutions; sustainability in higher education; agent of change; curriculum innovation; sustainability course inventory; student engagement

1. Introduction

The University of Toronto's President's Advisory Committee on the Environment, Climate Change, and Sustainability (CECCS) has developed a project intended to support undergraduate student engagement with sustainability issues that challenge the university and its neighbouring communities. This project, titled the Expanded Student Engagement Project (ESE), is working to expand student knowledge of sustainability-related course content and increase both on- and off-campus student engagement through sustainability focused curricular and non-curricular projects. The ESE's work presented here was conducted by five undergraduate research assistants and their supervisor, chair of the CECCS, over a period of 14 months.

The motivation for this work was to identify existing sustainability opportunities at the University of Toronto (U of T) and provide a foundation for the development of future opportunities and sustainability programs. This paper investigates the process by which the ESE created its primary deliverables: three inventories which catalogue (1) undergraduate courses with sustainability content (2) undergraduate courses with sustainability focused community-engaged learning (CEL) opportunities and (3) undergraduate co-curricular and extracurricular opportunities actively promoting sustainability at the U of T. Additionally, we discuss the process of clustering the first inventory around a novel framework derived from the United Nations (UN) Sustainable Development Goals (SDGs), and clustering the second inventory by adapting McRae and Johnson's Global Work-Integrated Learning Framework [1]. This paper presents some of the first course inventory methodologies in the literature. Further, although Yale University has organized faculty research interests using the SDGs [2], this paper presents the first usage of the SDGs to identify and cluster sustainability courses at higher education institutions (HEIs). We seek to emphasize the practical use of the SDGs as indicators for sustainability course content. We demonstrate how the inventories work in service of embedding sustainability pedagogy into curricula across the numerous departments operating at U of T.

This paper is intended to serve as a case study for other HEIs working to expanding student engagement in sustainability. We have paid particular attention to the many tensions that appeared during the development of our inventories. It is our hope that the practical lessons presented in their resolutions will prove useful to sustainability practitioners at other HEIs. To achieve this goal, we will begin this paper by grounding our work in the theoretical frames which detail the changing role of the university in society, as well as curriculum innovation for sustainability education. Following this review we discuss relevant contextual factors at U of T to provide a basis for comparative analysis between institutions. The methodologies for creating these inventories are then closely examined, including a review of methods used by other HEIs and our use of the SDG framework, before the results are presented. To conclude, the relevance of this work to the creation of sustainability pathways and the future work of the ESE are discussed.

2. Context

The role of the University as an actor in society has been changing from its traditional role as a knowledge institution. Its new purpose manifests a wider, outward facing scope for University activities. In other words, collaboration with external partners is becoming standard practice for HEIs such that the human capital, research and expertise already produced by the University have the greatest impact in society [3–5]. Thus, the University emerges as an Agent of Change (AOC) in its immediate community through mutually beneficial relationships within its local context. Further, with knowledge transfer among HEIs becoming ever more consistent, there is meaningful potential to expand the impact of these collaborations globally and in a large variety of local contexts.

Another change in HEIs is a greater emphasis on experiential learning to solve pressing issues identified by society [6]. Specifically, this has involved creating more opportunities for solutions-based pedagogy, often guided by collaboration with partners outside academia (this could include operational staff at the university, civil society organizations, or private sector actors) [7]. This educational strategy is called the "Living Lab" approach at U of T, also called "real-world laboratories," "urban living labs," and "sustainability learning labs" [8–10]. HEIs employing the model demonstrate a few consistent principles across "Living Lab" activities [9,11,12]:

- (1) Formal and equitable collaboration with both operational and community partners to identify and solve real sustainability issues;
- (2) Training of career ready graduates through external placements;
- (3) Emphasis on promoting and expanding experiential learning opportunities;
- (4) Intentional knowledge transfers beyond academic circles; and
- (5) Institutional commitment to transdisciplinary thinking [4,5,11,13–15].

Living Lab activities which engage students also significantly impact their educational experience and foster sustainability thinking.

It is widely acknowledged that sustainability is a perspective inextricably tied to complex and systemic problems, and its approaches are necessarily framed by the attempt to develop relevant practical solutions that integrate theories, practices and insights from diverse bodies of knowledge [16–19]. Hence, as Aktaş suggests, “a viable way to increase the role of sustainability in higher education is to foster interdisciplinary research and teaching” [20] (p. 354). Although U of T’s School of the Environment offers interdisciplinary B.A. and B.Sc. programs which span the natural sciences, social sciences, and humanities, it is the vision of the ESE to make such options available throughout all undergraduate programs at U of T. Creating widely available interdisciplinary training in sustainability requires going beyond the disciplinary structure of degree programs to create an overarching and interdisciplinary trajectory in sustainability. Every department is relevant to sustainability research and can be represented in curricular sustainability offerings.

In addition, as Wright, Cain, and Monsour argue, to generate the mindset required for transformative sustainability education, curriculum development must adopt more experiential, community-integrated, and practice-oriented approaches to teaching [21]. With the support of campus leaders and administrators, curriculum innovation for sustainability should look like “creative and critical application of knowledge and skills (that) are supported by authentic experience within the classroom.” [21] (p. 2). Such sustainability curriculum innovation in HEIs requires top-down support [22,23]. To this end the ESE aims to provide administrative tools for the development of interdisciplinary and eventually transformative sustainability experiential learning initiatives.

A motivating curriculum structure that encourages interdisciplinarity and experiential sustainability learning is Sustainability Pathways. The ESE’s concept of sustainability pathways derives from the University of British Columbia (UBC)’s sustainability curriculum initiative called the Sustainability Learning Pathways (SLP) [24]. The main goal of the SLP is that any student, regardless of their degree program, will have access to an education in sustainability through a learning trajectory complementing and weaving through their disciplinary education. The UBC SLP program outlines the following attributes for a trajectory of for-credit sustainability pathway courses:

- (1) Accessible to all undergraduate students regardless of degree program;
- (2) Interdisciplinary;
- (3) Can be completed by students through their existing degree program;
- (4) Involves research, co-curricular projects and/or community-engaged learning courses; and
- (5) Provides a coherent sustainability education [24].

Recent developments in sustainability leadership at the University of Toronto have identified such development as a priority for the institution. Understanding the policy and structural context of the University of Toronto is important to situate how such widely available interdisciplinary and experiential sustainability opportunities could be developed.

The University of Toronto is the largest HEI in Canada, with over 89,000 full-time and part-time undergraduate and graduate students [25]. It has three campuses across the Greater Toronto Area; the University of Toronto St. George (UTSG) is the university’s main campus and is located in downtown Toronto. Two smaller campuses are located outside of downtown Toronto in Mississauga (University of Toronto Mississauga, UTM) and in Scarborough (University of Toronto Scarborough, UTSC). Each campus has a Sustainability Office, which is tasked with ensuring the sustainability of Facilities and Services operations.

In 2016, U of T faced significant pressure from students to divest from fossil fuels. Subsequently, the Office of the President outlined new goals and commitments for sustainability action in the 2016 report *Beyond Divestment: Action on Climate Change* which included the creation of the President’s Advisory Committee on Environment, Climate Change, and Sustainability (CECCS): a committee of faculty, staff, students and alumni who are tasked to ensure that the goals of the report are

implemented [26]. After four months of operating, the CECCS published the *Annual Report 2017* which outlined the strategy and action items for the CECCS as well as setting the priorities for three subcommittees: the Campus as a Living Lab Subcommittee (CLL), the Agent of Change Subcommittee (AOC), and the Curriculum Innovation Subcommittee (CI) [3]. Each subcommittee has priorities and action items that are consistent with the literature explored in the sections above. The ESE works to achieve the objectives of the CI subcommittee and acts as the informal operating arm. This work is summarized in the ESE's four central goals:

- (1) Create a sustainability inventory that is made available to students interested in choosing sustainability related courses;
- (2) Create a list of faculty teaching in the sustainability area that is available to all those faculty members, hopefully contributing to a greater sense of common identity and community;
- (3) Contribute to the creation of curricular 'sustainability pathways' for U of T students; and
- (4) Develop more curricular and co-curricular student engagement opportunities related to sustainability, in collaboration with U of T organizations, specifically through the use of the community-engaged learning inventory.

In its *Annual Report 2018*, the CECCS identifies significant progress on these items related to curriculum innovation, as well as some additional highlights which cross-cut the committee's operations:

- (1) The CLL subcommittee has identified six living lab projects and is developing a template for student engagement alongside a Charter of Principles for these projects;
- (2) The AOC subcommittee has prepared a typology of forms of engagement with partners on sustainability projects;
- (3) On behalf of the CI subcommittee, the ESE project developed inventories of undergraduate sustainability courses, sustainability-oriented community-engaged learning courses, and of student clubs with a sustainability focus; and
- (4) The CI subcommittee has begun work on implementing sustainability pathways in four divisions [27].

U of T does not have an interdisciplinary academic division devoted to developing sustainability curriculum across academic disciplines, resulting in limited financial and labour resources available for such purposes [28]. As well, U of T has less of a pre-existing culture and research interest in sustainability compared to universities in British Columbia and Quebec [28].

Despite these challenges, there is great potential for effective curriculum innovation in sustainability education at U of T due to its size and existing interdisciplinary program structures such as those in the Faculty of Arts and Science (FAS) [29]. In addition, U of T is engaged in several inter-institutional networks which seek to foster knowledge transfer and communication of best practices, notably the Association for the Advancement of Sustainability in Higher Education (AASHE) [30] and the University Climate Change Coalition (UC3) [31].

In addition to these opportunities to embed and connect sustainability education throughout the university, U of T, along with every university and college in the province, has signed a Strategic Mandate Agreement (SMA) with the Government of Ontario's Ministry of Advanced Education and Skills Development [32]. These SMAs outline "System-Wide" and "Institution-Specific" targets to formalize "shared objectives and priorities" between educational and governmental entities (p. 6). Importantly for the ESE, one of U of T's SMA metrics commits the university to "the expansion of high-quality, pedagogically-sound work-integrated learning and experiential learning (WIL/EL) opportunities across undergraduate, graduate and professional programs" (p. 4). The U of T Task Force on Experiential Learning is responsible for achieving this priority and has released a white paper that standardizes the definition of experiential learning in the U of T context. The white paper concludes by recommending that the university better catalogue its experiential learning opportunities [8], thus demonstrating high-level administrative support for inventory work.

3. Methods

We shaped this paper as a case study to illustrate the challenges which arose throughout the project, and the reasons for choosing particular solutions. To paraphrase Bruno Latour, a case study opens the possibility to show a step-by-step project in-the-making rather than a ready-made solution [33]. The case study as a communicative approach has been adopted by other HEIs wanting to outline their development of sustainability programs, commitment to curriculum innovation and establishment of living labs [34–36]. As Dmochowski noted in a case study of the University of Pennsylvania (Penn), “the purpose of this paper is to share the strategy used at [Penn] and provide an evaluation of its success and guidance to others creating similar programs” [37]. This format is a critical asset for developing sustainability programs at other HEIs like the ones developed at the University of Toronto.

In this following section we will review the methods used to create the three inventories of sustainability opportunities available to undergraduate students at U of T.

3.1. Sustainability Course Inventory Method

Sustainability course inventories (SCIs) are common practice for universities who participate in sustainability reporting systems, such as the AASHE Sustainability Tracking, Assessment, and Rating System (STARS) [38]. Course inventories increase awareness of sustainability course offerings and highlight the inherent interdisciplinarity of sustainability [37]. Additionally, SCIs provide a metric to track changes in the amount of focus on sustainability in the curriculum across the university [39] and offer increased access to sustainability education opportunities at institutions.

A review of sustainability course inventories developed by North American universities revealed three popular methods to identifying courses for SCIs:

- (1) Review of course titles and descriptions by the department, office, or group that is creating the inventory (e.g., [40–42])
- (2) Survey of academic deans, chairs, or instructors to identify sustainability courses (e.g., [43,44])
- (3) Keyword search of course catalogue (e.g., [45–47])

Many HEIs develop inventories using combinations of the above methodologies. Surveys of faculty members are sometimes conducted to confirm the results of inventories done by reviewing courses or keyword searches [43,45,48]. This method provides validation of the inventory results but does not rely on a high survey response rate to create a complete inventory.

The U of T Sustainability Course Inventory was developed using a keyword search of Course Finder [49], the central and exhaustive database of the tri-campus undergraduate courses. This methodology was chosen because resources were not available to individually review the more than 8000 undergraduate courses at U of T. Further, university regulations prevented us from using a survey method to identify courses. Finally, the method is transparent and requires least subjective judgement, making it easy to operationalize for updating the inventory in future years [50]. Graduate courses are not included in the SCI because U of T does not have a central graduate course catalogue in which a keyword search could be conducted.

The keywords used for the SCI were developed using the United Nation’s Sustainable Development Goals (SDGs). Two to seven keywords were chosen for each SDG to describe each Goal as completely and precisely as possible without overlapping with the other SDGs. The keywords were selected by the ESE team based on a list of SDG keywords provided by the Sustainable Development Solutions Network (SDSN) Australia/Pacific Branch [50] and approved by the members of the CECCS.

The keyword search results were reviewed by course title and course description when necessary, and non-sustainability courses were removed from the inventory. This secondary filtering process is subjective but transparent, and a list of deleted courses was kept available. Such filtering was required because several keywords refer to different topics based on context, such as “environment” in “business environment”. Courses were tagged with all SDGs for which they returned a keyword. About 25% of all search results were filtered out.

The taxonomy of SDGs and keywords is presented in Table 1. An effort was made to use a similar number of keywords for each SDG however priority was given to selecting a set of keywords that spanned, and are unique to, the problem area of each SDG. Additional effort was made to minimize repetition of keywords, however exceptions were made for *water* (SDGs 6 and 14), *conserve** (SDGs 14 and 15) and *pollute* (SDGs 14 and 15), as they were identified as essential keywords which could not be limited to one SDG. The keyword *sustainab** was not included because it is not specific to one SDG, and we found that it did not yield any courses that were not already identified by other keywords.

Table 1. Sustainable Development Goal keywords used to create the sustainability course inventory (SCI) (Sustainable Development Goal (SDG) text from [51]).

Sustainable Development Goal	Keywords ¹
Goal 1 End poverty in all its forms everywhere	<i>poverty, income distribution, wealth distribution, socio economic</i>
Goal 2 End hunger, achieve food security and improved nutrition and promote sustainable agriculture	<i>agriculture, food, nutrition</i>
Goal 3 Ensure healthy lives and promote well-being for all at all ages	<i>health, well being</i>
Goal 4 Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	<i>educat*, inclusive, equitable</i>
Goal 5 Achieve gender equality and empower all women and girls	<i>gender, women, equality, girl, queer</i>
Goal 6 Ensure availability and sustainable management of water and sanitation for all	<i>water, sanitation</i>
Goal 7 Ensure access to affordable, reliable, sustainable and modern energy for all	<i>energy, renewable, wind, solar, geothermal, hydroelectric</i>
Goal 8 Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	<i>employment, economic growth, sustainable development, labour, worker, wage</i>
Goal 9 Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	<i>infrastructure, innovation, industr*, buildings</i>
Goal 10 Reduce inequality within and among countries	<i>trade, inequality, financial market, taxation</i>
Goal 11 Make cities and human settlements inclusive, safe, resilient and sustainable	<i>cities*, urban, resilien*, rural</i>
Goal 12 Ensure sustainable consumption and production patterns	<i>consum*, production, waste, natural resources, recycl*, industrial ecology, sustainable design</i>
Goal 13 Take urgent action to combat climate change and its impacts	<i>climate, greenhouse gas, environment, global warming, weather</i>
Goal 14 Conserve and sustainably use the oceans, seas and marine resources for sustainable development	<i>ocean, marine, water, pollut*, conserve*, fish</i>
Goal 15 Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	<i>forest, biodiversity, ecology, pollut*, conserve*, land use</i>
Goal 16 Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	<i>institution, justice, governance, peace, rights</i>

¹ An asterisk next to an abbreviated word is syntax for the search engines used to search all variants of that abbreviation. For example, searching *educat** returns results including *educate, education, and educator*.

The Sustainable Development Goals were designed as a framework to identify and cluster sustainability courses because of their international adoption, expert formulation, and comprehensiveness on the topic of sustainability [52] (Le Blanc argues that the SDGs have better integration across sectors than their predecessors, the MDGs. This integration is understood as improved comprehensiveness of

the interconnected challenges in sustainability.) The SDGs consist of a set of 17 goals, 169 targets, and 243 indicators that UN member states designed and adopted to use as a framework for development policy until 2030 [53]. They are an extension of the Millennium Development Goals (MDGs) and were adopted by world leaders in 2015 as a part of the 2030 Agenda for Sustainable Development [51]. These goals are not legally binding, therefore governments are expected to design their own process for implementation of policy to further these goals [54]. Goal 17, “Strengthen the means of implementation and revitalize the goal partnership for sustainable development,” was excluded from our methodology, as it encompasses the act of achieving the other goals rather than bringing a new perspective to sustainability, making it poorly-fitting for this purpose.

Since the development of the SDGs, the United Nations (UN) and its affiliated organizations have strongly encouraged the use of the goals to frame problem solving in higher education institutions [55]. The UN Sustainable Development Solution Network (SDSN), is a UN General-Secretary organization working to develop and coordinate global research and technological expertise to promote practical solutions for sustainable development, specifically the implementation of the SDGs [55]. It argues that universities play a critical role in sustainable development, as the task of achieving the SDGs is so large, universities have the potential to accelerate action in SDGs. The SDGs provide a new way to communicate to the public about the relevancy of HEIs, especially as drivers of solving global problems while also providing a single framework for addressing global problems [50]. These arguments for engaging with the SDGs all relate to the growing role of HEIs to train students to develop problem-solving skills [5,56]. Yet, the use of the SDGs as global indicators is often contested, even with specific targets and indicators for the goals, the goals are still described as broad, vague, and confusing [54]. Our judgement was that, despite these concerns, the SDGs provided a powerful basis for assessing the sustainability content for U of T courses.

3.2. CEL Sustainability Inventory Method

The Community-Engaged Learning (CEL) Sustainability Inventory is an inventory of CEL courses at U of T in which students work on sustainability projects. The inventory seeks to identify opportunities for students to contribute to for-credit projects working on sustainability in a community, locally or internationally. The definition of community-engaged learning used by the inventory was adopted to align with the definition of CEL set out in the previously mentioned U of T white paper on experiential learning. CEL is viewed as an experiential learning activity “in which students contribute to meaningful projects within a community for the purpose of addressing existing needs of individuals, agencies or organizations that are not currently being met, as well as enhancing student learning and development” [8]. CEL opportunities are a type of living lab activity in which students contribute solutions to real sustainability challenges with the guidance of external partners.

To identify CEL sustainability courses, we again used a keyword search methodology. This methodology was used for the same reasons as for the SCI, however different keywords were needed to identify CEL courses. The CEL keywords were: **placement*, **community*, **experiential*, **internship*, **partner*, **client*, and **service*. The ESE team then assessed the search results by reading each course description and documented the courses which satisfied two criteria: (1) they explicitly mentioned integration of CEL, and (2) they included CEL opportunities that were likely to address challenges related to sustainability. In an effort to foster a community of sustainability educators and partners at the university, the instructor name(s), email(s), and max course enrolment were recorded where available. The CEL sustainability inventory was developed separately from the SCI because CEL courses offer an educational experience for which students may search specifically.

A challenge that arose when developing this inventory methodology was the level of subjectivity present in the second screening criteria mentioned above. Information about the projects students would work on was not available to our team because (1) the variety of projects possible in a course is not listed in the course descriptions; and (2) a centralized list of all community partners involved in curricular projects does not exist at U of T. Thus, without knowing the partners involved, nor the

projects offered, we were required to assess whether a course captured by the CEL keywords was likely to have sustainability focused placement opportunities. The difficulty of this judgement is seen in the course APS111: Engineering Strategies & Practice I. One group of engineering students in APS111 (Engineering Strategies & Practice I) may design a net-positive student space for a client, but a different cohort in the same course designs a production line process. Our team decided to apply an inclusive filter wherein the potential presence of sustainability projects was sufficient for inclusion in the CEL inventory. In this instance, APS111 was included in the inventory.

Another challenge, which also appeared with the SCI, was organizing CEL inventory data in a way that communicated the strengths and gaps present in the current course offerings. Colleagues at the Center for Community Partnerships, a U of T administrative unit focused on developing experiential learning opportunities, recommended the “Global Work Integrated Learning (WIL) Curricular Framework” [1]. This framework allowed the ESE to cluster the CEL inventory based on “type” of placement, such as Applied Learning versus Internship courses. We further refined the data by sorting the courses by academic division. The clustering achieved its purpose—as will be discussed in the result section—thus we highly recommend seeking out clustering frameworks that prove relevant to each HEI context.

3.3. Sustainability Co-Curricular and Extracurricular Inventory Method

The Sustainability Co-Curricular and Extracurricular Inventory is a two-part inventory which lists all non-course-based sustainability opportunities for students at U of T. The first part of the inventory is a list of the sustainability-focused co-curricular activities at the university which are recognized by the U of T Co-curricular Record (CCR) [57]. The CCR is a database of student clubs, programs, and other co-curricular opportunities maintained by central administration. If students participate in a CCR recognized club, they can gain distinction for extra-curricular involvement on their academic record. The ESE believes that increasing the visibility of these opportunities through inventory work is an effective way to expand student engagement because such participation is already incentivized by the University.

The Co-Curricular Inventory was developed using the same SDG keyword-search methodology as the SCI. The keywords were searched in the Opportunity Directory on the CCR website.

The second part of the inventory is a list of sustainability-focused student groups at the U of T St. George campus. It was developed in a collaborative effort with the Sustainability Commission of the University of Toronto Students Union (SCUTSU) and the University of Toronto Sustainability Office (UTSO), to provide a shareable resource for students. It lists all sustainability-focused extracurricular student groups at the university, including those that are not recognized by the CCR. Given U of T’s scale, the ESE believed creating this resource would render club initiative operating in disparate corners of the university visible to one another, thus opening potential for collaboration between student groups on sustainability projects.

The extracurricular inventory was developed by reading club descriptions on ULife, the official U of T online clubs directory [58], by canvassing interpersonal student group networks, and through other university websites and networks. The inventory is organized by affiliation or topic, including subject-focused groups, college-based groups, and student unions.

4. Results

4.1. Sustainability Course Inventory Results

The SCI found 2022 sustainability courses, which represents 25% of the 8158 undergraduate courses offered at U of T. Unique courses were defined as a course with a unique course code in its term (i.e., Fall or Winter). Different lecture sections of the same course were not counted as unique. The U of T SCI documents the following information: course code, course title, credits, campus, department, term, year level, total number of SDGs, keywords, the SDG(s) to which the course is related, and a link to the

course description. A sample page of the inventory is provided in Figure 1. The inventory is hosted on the website of the U of T Sustainability Office, available at: <http://www.fs.utoronto.ca/SustainabilityOffice/Resources/SustainabilityCourses> (See Supplementary Materials).

Course Code	Course Title	Campus	Department	Term	SDGs Covered
WGS347H5	Indigenous Feminisms and Decolonization	Mississauga	Historical Studies	2018 Fall	SDG 5, SDG 16
CIV401H1	Design and Optimization of Hydro and Wind Electric Plants	St. George	Civil Engineering	2018 Fall	SDG 7
CHM211H5	Fundamentals of Analytical Chemistry	Mississauga	Chemical and Physical Sciences	2018 Fall	SDG 13
RLG213H1	Reading Sacred Texts	St. George	Department for the Study of Religion	2018 Fall	SDG 13
MIE516H1	Combustion and Fuels	St. George	Mechanical & Industrial Engineering	2018 Fall	SDG 9, SDG 14, SDG 15
HMB441H1	Genetics of Human Disease	St. George	Human Biology Program	2018 Fall	SDG 3
ESS462H1	Global Biogeochemical Cycles	St. George	Earth Sciences	2018 Fall	SDG 14
WGS451H1	Independent Study in Women and Gender Studies Issues	St. George	Women and Gender Studies Institute	2018 Fall	SDG 5
JGE331H1	Resource and Environmental Theory	St. George	Geography and Planning	2018 Fall	SDG 13, SDG 14, SDG 15, SDG 16

Figure 1. A condensed sample page of the University of Toronto (U of T) Sustainability Course Inventory. (SDG = Sustainable Development Goal).

The SCI was compared with results from other Canadian HEIs that report sustainability courses through AASHE STARS [59]. Figure 2 shows that the maximum percentage of undergraduate courses that are sustainability course offerings is 32%, the minimum is 1%, and the median is 10%. U of T is in the upper quartile of these institutions. However it is difficult to draw conclusions by comparing inventory results with other self-reporting HEIs, because institutions may use different definitions of “sustainability courses” and different methods for identifying and counting courses.

The sustainability courses are found in six academic divisions across the university’s three campuses. The Faculty of Kinesiology & Physical Health is the only division which offers undergraduate courses but does not have any identified sustainability courses. Table 2 shows the repartition of sustainability courses by division and year level.

The inventory reveals that most sustainability courses at U of T are third- and fourth-year courses (42% and 30% of all sustainability courses, respectively). Most divisions offer the most sustainability courses in third year, however the Faculty of Applied Science & Engineering (FASE) offers significantly more sustainability courses (58%) in fourth year. This is for several reasons: some FASE 400-level courses are undergraduate/graduate mixed classes; the largest number of engineering courses are offered in fourth year overall; and, all engineering students take a fourth-year capstone design course which generally considers some aspect of sustainability.

Part of the work of creating the SCI included identifying the total number of undergraduate courses offered as this information was not readily available from university administration. Table 3 presents the number sustainability courses as a portion of total undergraduate courses by division and year level. These findings reveal that whereas the Faculty of Arts and Science (FAS) offers the most sustainability courses overall, there is a higher concentration of sustainability courses in the Faculty of Applied Science & Engineering (FASE), University of Toronto Mississauga (UTM), University of Toronto Scarborough (UTSC), and the John H. Daniels Faculty of Architecture, Landscape, & Design (FALD).

The highest concentration of sustainability courses is in FALD, in which 47% of undergraduate courses contain sustainability content. Impressively, 67% of third-year courses offered by FALD include sustainability content, compared to 30% of third-year courses across the university.

Tables 2 and 3 show that just 8% of all sustainability courses are offered in first year, which represents 18% of all 100-level courses. However, further research found that these courses have high enrolment; therefore, they are important for future curriculum innovation initiatives as they have the capacity to reach many students.

The SCI findings reveal that the most common SDG content in U of T sustainability courses are Goals 13 (climate change), 16 (peaceful and inclusive societies), and 5 (health, well-being) (Figure 3). These SDGs are represented in 25%, 20%, and 19% of total courses in the inventory respectively. These results reflect the focus of sustainability courses across U of T, however the results may be more useful at the divisional or departmental level.

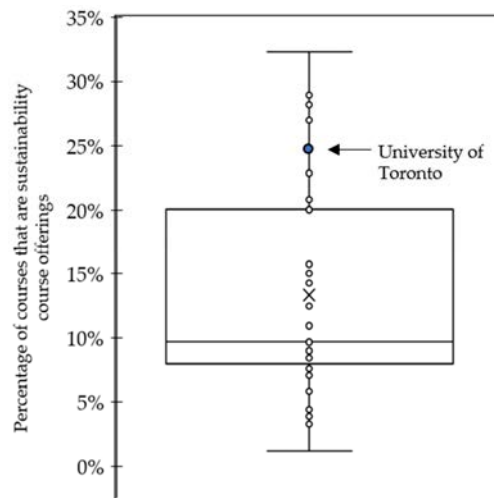


Figure 2. Percentage of undergraduate sustainability course offerings at Canadian higher education institutions (HEIs) with data from the Advancement of Sustainability in Higher Education Sustainability Tracking, Assessment, and Rating System (AASHE STARS) [59]. Courses that include sustainability encompass both “sustainability courses” and “courses that include sustainability” in the STARS framework. The cross represents the mean of the data; the blue dot indicates the U of T Sustainability Course Inventory (SCI).

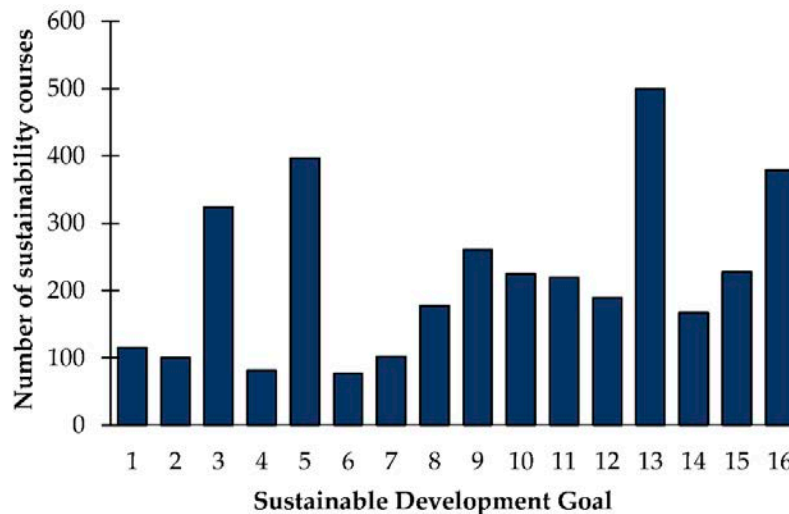
Table 2. Representation of undergraduate sustainability courses by academic division and year level.

Academic Division	100-Level	200-Level	300-Level	400+ Level ¹	Total
Faculty of Arts and Science	81	174	329	260	844
Faculty of Applied Science & Engineering	10	18	46	116	190
University of Toronto Mississauga	29	102	235	111	477
University of Toronto Scarborough	32	122	202	104	460
Faculty of Music	0	1	2	4	7
John H. Daniels Faculty of Architecture, Landscape, & Design	4	6	29	5	44
Faculty of Kinesiology & Physical Education	0	0	0	0	0
Total	156	423	843	600	2022

¹ 400+ Level courses refer to both undergraduate and mixed undergraduate/graduate courses.

Table 3. Portion of sustainability courses by academic division and year level.

Academic Division	100-Level	200-Level	300-Level	400+ Level	Total
Faculty of Arts and Science	24%	23%	26%	20%	23%
Faculty of Applied Science & Engineering	23%	22%	30%	49%	37%
University of Toronto Mississauga	25%	26%	37%	26%	30%
University of Toronto Scarborough	12%	32%	35%	22%	27%
Faculty of Music	0%	1%	2%	2%	1%
John H. Daniels Faculty of Architecture, Landscape, & Design	44%	25%	67%	28%	47%
Faculty of Kinesiology & Physical Education	0%	0%	0%	0%	0%
Total	18%	24%	30%	22%	25%

**Figure 3.** Number of sustainability courses covering each SDG. Note that courses may cover more than one SDG.

On the level of the academic division, emphasis on SDGs in particular subject areas becomes more apparent. For instance, in UTSC, UTM, and the Faculty of Arts and Science at UTSG, SDG 3 (health, well-being) and SDG 5 (gender equality) together represent more than half of the sustainability courses. In the Faculty of Applied Science and Engineering, more than half of the sustainability courses are represented under SDG 9 (sustainable infrastructure and innovation) and another quarter under SDG 7 (sustainable energy). Another interesting finding of the SDGs by subject area is that SDG 13 (climate change) does not represent the majority of sustainability courses in any one academic division, despite being the most represented SDG in the inventory.

Further analysis of the inventory sought to identify bias in the course results which may have resulted from using different numbers of keywords for each SDG. No relationship was found between the ratio of number of courses to number of keywords between different SDGs. The ratio of courses per keyword varied from 17 courses per keyword for SDG 7 (6 keywords) and 162 courses per keyword for SDG 3 (2 keywords).

The number of SDGs covered by a course was considered indicative of the degree of sustainability focus in the course. Many SDGs suggests that the course is multidisciplinary and teaches many sustainability issues. Further, the research efforts at Yale University which used the SDGs to identify

sustainability scholarship found that using the SDGs as a clustering scheme is a productive way to identify transdisciplinary connections and build sustainability networks [2].

4.2. CEL Sustainability Inventory Results

The CEL Sustainability Inventory includes 154 CEL courses with sustainability content at U of T, which represents 36% of the 425 CEL courses identified by the keyword search. The CEL Sustainability includes course code, course title, credits, campus, department, term, division, associated keywords, and a hyperlink to the course description. A sample page from the inventory is provided in Figure 4.

Course Code	Course Title	Campus	Department	Term	Division
CSC454H1	The Business of Software	St. George	Computer Science	2019 Winter	Faculty of Arts and Science
SOC315H1	Domestic Violence	St. George	Sociology	2019 Winter	Faculty of Arts and Science
HST330H1	Population Health	St. George	University College	2019 Winter	Faculty of Arts and Science
GGR313H5	Gender and the City	Mississauga	Geography	2019 Winter	University of Toronto Mississauga
WRI411H5	Professional Writing and Communication Internship II	Mississauga	Institute of Communication and Culture	2019 Winter	University of Toronto Mississauga
CHM399Y5	Research Opportunity Program	Mississauga	Chemical and Physical Sciences	2019 Winter	University of Toronto Mississauga
FRED06H3	Language Practice VIII: Oral French	Scarborough	Centre for French and Linguistics (UTSC)	2019 Winter	University of Toronto Scarborough
CCT410H5	CCIT Internship I	Mississauga	Institute of Communication and Culture	2019 Winter	University of Toronto Mississauga
MIE315H1	Design for the Environment	St. George	Mechanical & Industrial Engineering	2019 Winter	Faculty of Applied Science & Engineering
CIV523H1	Geotechnical Design	St. George	Civil Engineering	2019 Winter	Faculty of Applied Science & Engineering

Figure 4. A condensed sample page of the U of T community-engaged learning (CEL) Sustainability Inventory.

Table 4 summarizes the CEL Sustainability Inventory by academic division, summarizing the faculty teaching CEL, across how many courses, and the total student enrolment therein. The courses are also tagged using an adapted version of McRae and Johnson's Global Work-Integrated Learning Framework [1], summarized in Table 5. The framework was changed to exclude the categories Apprenticeship, Clinic, and Co-op as they did not align with our definition of CEL.

Table 5 reveals how clustering the CEL inventory reveals gaps and trends in CEL sustainability course offerings. For example:

- (1) The Faculty of Applied Science & Engineering offers vast Applied Research Sustainability CEL courses.
- (2) The University of Toronto Scarborough does not offer any Sustainability Internship courses, whereas these courses make up over half (58%) of the University of Toronto Mississauga Sustainability CEL offerings.

- (3) Applied Research Sustainability courses only comprise 16% of all Sustainability CEL courses at U of T. Curricular Community Service Learning and Internship offerings are predominant with 36% and 27% of total U of T Sustainability CEL courses respectively.

Table 4. Number of faculty, sustainability community-engaged learning (CEL) courses, and max enrolment in sustainability CEL courses.

Academic Division	Instructors Teaching Sustainability CEL	Total Sustainability CEL Courses	Max Student Enrolment
Faculty of Arts and Science	34	63	1783
Faculty of Applied Science & Engineering	18	15	1492
University of Toronto Mississauga	24	38	1173
University of Toronto Scarborough	10	34	878
Faculty of Music	0	0	0
John H. Daniels Faculty of Architecture, Landscape, & Design	N/A ¹	3	20
Total	86	154	5346

¹ Instructors were identified as available on the U of T Course Finder. Instructor names were not available for the Faculty of Architecture at the time of the inventory, and therefore were not counted.

Table 5. Sustainability CEL courses clustered into categories from McRae and Johnson's Global Work-Integrated Learning Framework [1].

Academic Division	Applied Research	Curricular Community Service Learning	Internship	Field Placement	Practicum/Clinical Placement	Work Experience
Faculty of Arts and Science	6	29	16	2	7	3
Faculty of Applied Science & Engineering	12	2	2	0	0	0
University of Toronto Mississauga	2	10	22	0	3	1
University of Toronto Scarborough	5	14	0	0	12	3
Faculty of Music	0	0	0	0	0	0
John H. Daniels Faculty of Architecture, Landscape, & Design	0	1	2	0	0	0
Total	25	56	42	2	22	7

These data are highly instrumental and compelling. They are the raw data with which curricula interventions could be justified. As a concrete example, the ESE argued in its Annual Report (2017) that there is clearly potential to expand the amount of Applied Research course offerings on the Mississauga and Scarborough campuses, and fortunately these may be the easiest to develop. Applied Research courses like ENV461 (The U of T Campus as a Living Lab of Sustainability) pull clients from the everyday operating departments of the University itself. In other words, the projects and clients are already present on campus. All that remains is finding a faculty member willing to organize the clients and evaluate the students' work.

The ESE explored the relationship between the results of our SCI inventory and the CEL inventory. Initially, the team's assumed that if we used Excel to cross-reference the inventories and reveal duplicates that many courses would appear. Both inventories capture sustainability courses, but with different sets of keywords as outlined in the methodology sections of both inventories. Yet, in cross-referencing the 2022 SDG courses with the 154 CEL courses the ESE team found only 65 courses that conformed

to both sets of keywords. The disconnect between perception and the inventory's reality was found in the particular language used in CEL course descriptions. These course descriptions were often general about the types of projects or placements offered because they change regularly. The SDG keywords sought to capture substantive phrases which were not found in the course descriptions and therefore there is limited intersection between the inventories.

4.3. Sustainability Co-Curricular and Extracurricular Inventory Results

The Sustainability Co-Curricular Inventory keyword search identified 263 sustainability-focused opportunities for students which are approved for the university's Co-Curricular Record. The CCR inventory includes the name of the opportunity, number of positions available to students, keywords, related SDGs, and a hyperlink to a description of the position.

In the Extracurricular Inventory 67 sustainability-focused student groups were identified with the help of the Students Union Sustainability Commission and other sustainability student networks. It includes the group name, how the group was identified for the inventory, and the school year that the contact was last updated. The inventory also includes personal contact information for the club executives to help interested students contact the clubs directly to become involved.

These two inventory lists are not mutually exclusive, however they meet two different objectives for students searching for sustainability-focused opportunities. Student networks have reported to us that they look for CCR opportunities when they are searching for official work placements or internships, whereas they look for lower-commitment, student group involvement on the ULife website and other club listings. Sample pages of the Co-Curricular and Student Groups Inventory are provided in Figure 5.

The ESE is pleased to report that the Sustainability Commission of the University of Toronto Students Union used the first version of our Extracurricular Inventory to hold Sustainability Commissions throughout the 2017–2018 school year. Sustainability student groups were identified and brought together for a visioning process to identify gaps in U of T's sustainability infrastructure. Projects to reduce energy consumption, expand composting programs, and reduce food packaging were undertaken and student leaders pledged the unique resources of their clubs in a deeply collaborative manner. We believe this is an excellent first step towards creating a network of sustainability champions at U of T.

Group	Source	Contact Last Updated (Academic Year)
General Sustainability		
University of Toronto Environmental Resource Network	Website	2017–2018
University of Toronto Student Union Sustainability Commission	SO Connection	2017–2018
Environmental Justice Collective	ULife	2016–2017
Leap Chapter UofT	ULife	2017–2018
Regenesis UofT		2016–2017
Greenpeace Student Network		2016–2017
UofT Environmental Action	UTERN	2016–2017

Figure 5. Cont.

Activity	Positions	SDGs Covered
Development League, Faculty of Kinesiology & Physical Education	1	SDG 4
Urban Non-Violent Initiatives Through Youth (UNITY), Student Organization	8	SDG 11, SDG 13
Waawaakte Northern Lights Initiative	1	SDG 4
ILead: Graduate Group, Faculty of Applied Science & Engineering	7	SDG 2
(b) Student Staff, Factor-Inwentash Faculty of Social Work	N/A	SDG 3, SDG 4, SDG 5
Urban Studies Student Union (URSSU), Student Organization	7	SDG 11, SDG 12
Student Staff, John H. Daniels Architecture, Landscape & Design	N/A	SDG 4, SDG 6, SDG 9, SDG 11, SDG 12, SDG 13, SDG 14, SDG 15
Camp U of T	1	SDG 3, SDG 13
Rotman Commerce Pride Alliance, Student Life—Rotman Commerce, Student Organizations	6	SDG 4

Figure 5. Condensed sample pages of the U of T (a) Co-Curricular and (b) Extracurricular Sustainability Inventory. Student contacts have been omitted for privacy.

5. Ongoing and Future Work

The creation of the three sustainability inventories is a fundamental step towards the third objective of the ESE, to develop sustainability pathways accessible to all students within their degree program. We have developed a proposal for a three-tiered pathways program which uses the inventories to identify curricular and non-curricular opportunities for student engagement in sustainability. The first tier, Sustainability Citizen, acknowledges co-curricular and extracurricular involvement in sustainability extracurricular activities. The second, Sustainability Scholar, is a curricular pathway where students would earn a certificate for completing a trajectory of existing for-credit courses. The third, Sustainability Leader, is a more intensive pathway through which students follow a trajectory of co-curricular activities, curricular courses, international experience, and a capstone course. The SCI is a central tool for the development of such Sustainability Scholar and Sustainability Leader programs. The number of SDGs to which a course is tagged can be used to indicate the degree to which they are sustainability-focused, and a variety of SDGs can be represented in each pathway to ensure interdisciplinary groups of courses. Similarly, the CEL Sustainability Inventory and Sustainability Co-curricular and Extracurricular Inventories are critical to lists of opportunities for building the Sustainability Citizen and Sustainability Leader pathways. Work on the pathways is ongoing within several academic divisions at the university.

Beyond contributing to the development of sustainability pathways, future work for the ESE includes confirming the results of the SCI through a survey of all faculty and instructors. This feedback will help validate the results of the keyword search, identify any courses not found through the search, and flag any courses which contained the keywords but which the instructor does not believe is a sustainability course. Challenges exist to releasing such a survey due to the university's restrictions on mass emails to faculty and staff.

Additionally, future work exists to make the inventories highly accessible to students. In addition to hosting the SCI on the website of the UTSO, we hope future developments will allow the inventory to be integrated into U of T's major course selection platforms, making sustainability course options more visible to students.

We hope to expand the SCI to include graduate courses. There is not a central catalogue of graduate courses and therefore this demands increased resources. If it is not possible to conduct a keyword search, a different inventory method could be investigated.

To continue building a community of sustainability educators at the university, and to increase experiential learning opportunities in sustainability, a workshop is being planned in collaboration with the U of T Centre for Community Partnerships to help instructors identify methods to increase CEL in their courses.

6. Conclusions

There is growing movement for universities to take a more active role in society by conducting solution-driven research and engaging with community partners, for the benefit of both students and the broader community [4,5,20]. In 2017, the University of Toronto formed a Presidential Advisory Committee on Environment, Climate Change, and Sustainability which set goals for the university to contribute [3]. Under the directive of the Curriculum Innovation subcommittee of the CECCS, the Expanded Student Engagement project set out four goals to identify sustainability content in the undergraduate curriculum and to provide guidance towards creating a transformative sustainability education through experiential learning.

The first goal—creating a set of sustainability inventories—was achieved. A keyword search methodology was developed using 16 of the 17 UN Sustainable Development Goals to create an SCI. The number of 2022 undergraduate sustainability courses was identified, 25% of all undergraduate courses. Further, a CEL Sustainability Inventory was developed which identified 154 CEL courses with sustainability content. These courses were clustered by type of learning activity using an adapted version of McRae and Johnson's Global Work-Integrated Learning Framework. Finally, inventories were developed of sustainability-focused co-curricular and extracurricular opportunities available to students at the university. Two hundred and sixty three university-recognized opportunities and 67 student groups were identified. These inventory methods, now in place, are designed to be easily updated in future years. These course inventory methodologies are some of the first presented in the literature and may be useful to other HEIs who wish to undertake a similar initiative. The second goal—creating a list of faculty teaching sustainability and sustainability-CEL courses—was achieved through the SCI and CEL Sustainability Inventory. During the keyword search, faculty teaching of each sustainability course was identified. This list has been made available to the CECCS.

The ESE's future research developments and goals focus on the third and fourth goal. The third goal is to contribute to the creation of curricular sustainability pathways for all U of T students. Several steps forward have been made towards this goal by using the course inventories to inform strategies for pathways courses and engagement opportunities. As described above, the ESE will continue to work with the CECCS to further develop the pathways. Finally, the fourth goal of the ESE is to develop more curricular and co-curricular student engagement opportunities related to sustainability. The creation of the CEL Sustainability Inventory is a necessary first step to identify courses where these opportunities can be provided and the ESE is currently working on hosting workshops to develop these opportunities further.

The inventories work as infrastructure to support a bottom-up groundswell of sustainability engagement in the University of Toronto. They are designed to connect instructors who teach sustainability and CEL content, enhance sustainability programs through collaboration, provide a meaningful tool for curriculum innovation in sustainability, increase student enrolment in sustainability courses by effectively communicating their presence, and increase awareness of opportunities in sustainability outside of the classroom. Clustering the inventories highlights the gaps, unexpected connections, and areas of growth for sustainability initiatives from actors across HEIs. Hence, through achieving the above four goals, the ESE hopes to meaningfully support the integration of sustainability content into all aspects of students' academic experience at U of T. If the ESE is

successful, a new generation of leaders will have the opportunity and tools to address sustainability challenges faced in our local and global communities.

Supplementary Materials: The complete U of T Sustainability Course Inventory is available online at: <http://www.fs.utoronto.ca/SustainabilityOffice/Resources/SustainabilityCourses>.

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Appendix 4 - CEL sustainability workshop report

Advancing Sustainability in Community Engaged Learning Workshop

May 3, 2019

Purpose

The Advancing Sustainability in Community Engaged Learning (CEL) Workshop was held on May 3rd, 2019, sponsored by the Centre for Community Partnerships (CCP) and the President's Advisory Committee on the Environment, Climate Change and Sustainability (ECCS). The Workshop aimed to make cross-disciplinary connections and build community among U of T stakeholders active in teaching and administering CEL and sustainability at the University. Participants were U of T faculty who had been identified as teaching sustainability-oriented CEL courses. They participated in a discussion to identify barriers and opportunities to improve and expand offering of sustainability integrated CEL projects and courses.

Emergent Themes of Discussion:

- i) **Sustainability as a 'Lens'**
- ii) **CEL as a Theoretical Lens**
- iii) **Partnerships**
- iv) **Knowledge Democracy/Translation/Mobilization**
- v) **Limitations**

Discussion

- i) **Sustainability as a 'Lens':** On CEL expansion goal
 - Why CEL and sustainability? Students learn their part or position in the world through CEL projects. Sustainability is an ethos, way to think and be in the world. CEL is a way to build mature thinkers.
 - Do we want **all** students or faculty to do CEL? No, but there should be:
 - opportunity and support to do community engaged learning courses if instructors are interested and, the course offering for students who are interested.
 - How to expand CEL and sustainability?
 - Learn from the work of Truth and Reconciliation Committee (TRC) and how it has managed to integrate truth and reconciliation into courses and departmental objectives. Learnings from its strategy could be applied to expand sustainability and CEL.
- ii) **CEL as a Theoretical Lens:** Pedagogy and approach to employ for CEL projects in courses.
 - On Pedagogy:
 - a) Any goals for students in CEL courses? Minimum expectation could be not recreating prior assumptions and biases in their community placements—getting students to reflect on their preconceived notions before the placement.

b) Theoretical knowledge is needed as tools to supplement student practice.

- How to decide placements or projects? **Who** decides them?

Examples offered by participants:

- Prof. Robinson's Campus as a Living Labs course uses only partner-defined projects; since meeting 'client' needs means the project outcomes will likely be used or applied.
- New College Community Engaged Research/Practice courses host Partner directed projects.
- Impact Centre placements are partially partner-identified but placements are also screened by the instructor.
- 'Vic Reach' volunteer program has student-led placements, and then, theoretical learnings are integrated into Education and Society Minor courses to supplement student practice. Upper year placements are co-supervised by a Faculty and the Partner.

iii) **Partnerships:** Partnering with Community Organizations or Other Placement hosts

- Partnerships are precarious, on both ends. Difficult to build and maintain partnerships and can lose the partnership if key contact at University, or in partner organization, leaves.
- We must move away from the notion of sending 'expert students' and adopt more of a co-production of knowledge mode.

iv) **Knowledge Democracy/Translation/Mobilization:** How to leverage student learning and integrate it into community? How to increase learning and collaboration?

- University as an anchor institution
 - Example: Prof Taverna's idea of rotating placement students between the three Long Term Care Facilities in his course, instead of each student completing a placement at only one facility. This way, the students can connect nearby facilities with one another, and create a channel for knowledge sharing in the community.
 - Connecting CEL students working on similar projects, or in nearby areas with one another for healthy challenges to their critical thinking skills and to integrate diverse perspectives in their outcomes. For example; connecting two student projects, one focusing on environmental benefits and the other working on improving accessibility in the same community for discussion and critique.

v) **Limitations**

- Isabelle Kim presented some key findings from the CCP report 'Benefits, costs and impacts of Community Engaged Learning university courses from perspectives of community partners, instructors and students' by Isabelle Kim, David Roberts, Susanne Burkhardt, and Caitlin Thompson.
 - The biggest costs to take part in CEL Courses for students, faculty and community partners was TIME. This includes opportunity cost of not working on something else (Faculty/Community Partners) or other paid work (students).

- Labour of love: “the cost of doing something you love’ as one of the faculty members interviewed described it
- Resource-intensive (TTC tokens, insurance, honoraria for participation from community partners, etc.,)
- Time as limitation
 - One semester is not enough for:
 - a) Theoretical learning before students enter into community
 - b) Providing adequate support for both types of students (keen starters and slow starters)
- Lack of Institutional support or structure
 - **For students:** horizontal and vertical integration of CEL projects can be beneficial, but presently no ‘pathway’ to do so.
 - **For Instructors/Faculty:**
 - b) Instructor may need to borrow other Faculty expertise for diverse projects. Need to build community and network for CEL instructors.
 - c) Lack of recognition/incentives for Faculty/Instructors doing CEL courses, or running Collaborative Specializations, etc.
 - d) Institutional excitement for new projects overtakes maintenance of present projects. Additional support required to keep up what is already being done.
 - e) External Review of Faculty should count and credit CEL courses as significant in achieving academic and research priorities of the Department and the University.

Emergent Idea

- Thread Model of Sustainability
 - Entrepreneurship (Private sector), Policy analysis and advice (governmental) and working with equity-seeking communities (Non-Profit) as mostly non-communicating ‘bubbles’ of CEL activities within sustainability work.
 - These three nexuses of Sustainability CEL should be brought together to interact with each other.
 - Create a Community of Practice (CoP) with key stakeholders from each ‘bubble.’ Would be an interdisciplinary and participatory group that shares knowledge and learnings. This CoP can be used to mobilize interdisciplinary agenda like sustainability and CEL expansion, and also create ripple effects within each of the ‘bubbles’.
 - Reference: Professor Blake Poland and Denise Gastaldo’s “Socially Engaged Citizenship Pathways to Health Equity for Displaced Populations” research proposal on creating communities of practice.

Next Steps

- Invite more Faculty to a follow-up event. Host break-out sessions and workshops to further discuss many topics touched upon in this meeting, in a themed manner.

- Reach out to instructors not teaching CEL, to find out their barriers to enter.

Participants:

Name	Affiliation
Blake Poland	Dalla Lana School of Public Health
David Roberts	Faculty of Arts & Science - Urban Studies
Linzi Manicom	New College
Monika Havelka	University of Toronto Mississauga
Alon Eisenstein	Impact Centre
William Watson	Faculty of Arts & Science - Criminology & Sociolegal Studies
Marina Freire-Gormaly	Faculty of Applied Science & Engineering
Franco Taverna	Faculty of Arts & Science - Human Biology
Yiola Cleovoulou	OISE and Victoria College
Julie Comay	OISE
John Robinson	Presidential Advisor Environment, Climate Change, and Sustainability (ECCS)
Isabelle Kim	Director, Centre of Community Partnerships
Katie Boomgaardt	Lead Coordinator, Academic Initiatives Centre for Community Partnerships
Dione Dias	Project Manager: CECCS
Rutu Patel	Intern: CECCS

Appendix 5 - Sustainability: Transdisciplinary Theory, Practice, and Action (STTPA) Conference

Sustainability rests on the principle that the biosphere is the foundation for all human activities, and our wellbeing depends on the health of our shared ecosystems. The path towards sustainability is possible only through a culture of sustainability that promotes the wellbeing of all generations, maintains healthy ecosystems, and fosters regenerative relations between natural, social, and technological systems. No academic discipline, corporation, country, first nation, government, or organization can achieve sustainability alone. We all have a role to play in the path towards sustainability.

The purpose of the Sustainability: Transdisciplinary Theory, Practice, and Action (STTPA) Conference at the University of Toronto Mississauga (UTM) is to bring together academics and students across all disciplines, Indigenous leaders and scholars, business executives, civil society, policymakers, sustainability professionals and other sustainability lovers, to explore innovative forms of theory, practice, and action that can help craft a path towards global sustainability. The main theme of the conference is **integration across disciplines, stakeholders, and sustainability pillars (such as social, environmental, and economic)**. The conference will be held from October 16-18, 2019 at UTM.

The conference program will include world renowned keynote speakers, plenary sessions, panel discussions, integrated (theory, practice, and action) sessions, concurrent sessions, workshops, poster (research and practice) presentations, exhibits and other formats of communication enabling all stakeholders to learn and contribute meaningfully to the path towards sustainability.

For more information, visit the conference website at <https://sttpaconference.com/>.

Appendix 6 - Tri-Campus Sustainability Innovation Prize

The inaugural U of T Sustainability Innovation Prize is a new annual competition offering \$15,000 in prizes to recognize, reward and accelerate the University of Toronto's most innovative sustainability ideas by student-led projects or startups. This prize was referred to as the "clean-tech challenge" in the 2018 Annual Report and was one of the points in the President's report 'Beyond Divestment: Taking Decisive Action on Climate Change'. This event has been discussed in previous CECCS meetings and based on the CECCS feedback was made into a more encompassing sustainability prize.

Ten finalist teams competed by showcasing their great idea in a five-minute pitch to a panel of judges on June 12, 2019. The event also provided a networking opportunity for the finalists, three successful U of T start-ups that were invited, and the sustainability innovation-minded audience. The three winning teams that each received a \$5,000 prize to develop their idea further were:

- Circular Toys - a circular economies company where families, schools, and individuals subscribe to receive eco-friendly toy packages that stimulate the child's mind and encourages teamwork.
- SoluSave - its goal is to build a device to recycle solvents that are used in undergraduate laboratories to cost effectively reduce waste. The recycler would be optimized for easy use, high purity, and scalability for different common solvents, beginning with acetone.
- STP Sports - aims to reduce the environmental footprint produced at professional sporting events by optimizing closed-loop supply chains and diverting waste from landfill. Also, to effectively and efficiently capture the value in organic waste produced at these events.

Appendix 7 - Sustainable Finance Research Roundtable

This roundtable was organized by the Michael Lee-Chin Family Institute for Corporate Citizenship and presented by the Rotman School of Management and the School of the Environment as part of the University of Toronto's participation in the Global Research Alliance for Sustainable Finance and Investment (GRASFI). The GRASFI was founded in 2017 by the University of Oxford and its network of global research universities, including the University of Toronto, in order to promote rigorous and highly impactful academic research on sustainable finance and investment. The purpose of this roundtable, held on April 10, 2019 at U of T, was to explore recent academic research on sustainable finance, including the role of institutional investors, the changing regulatory environment, accounting and reporting standards and organization change.

Attendees included faculty and PhDs candidates from Rotman School of Management, as well as a few from other faculties at U of T, other business schools, and research-minded people from financial institutions, foundations and more.

Speakers, presenters, and panelists included:

Alexander Dyck, Professor of Finance and Economic Analysis and Policy, Manulife Financial Chair in Financial Services and a Fellow of the Lee-Chin Institute, on "Institutional Investors Influencing Corporate ESG Performance"

Tiff Macklem, Dean of Rotman and Chair of the Canadian Federal Govt Expert Panel on Sustainable Finance, on the work of the Expert Panel so far

Gordon Richardson, KPMG Professor of Accounting, and Yue Li, Associate Professor, Accounting, on "Causes and Consequences of Voluntary Assurance of CSR Reports"

Diane-Laure Arjaliès, Assistant Professor, Managerial Accounting and Control, General Management & Sustainability at Ivey Business School, Western University, and Tima Bansal, Professor, General Management, Sustainability & Strategy at Ivey, on "The Transformation of Part of an Investment Company to ESG Orientation"

Keith Ambachtsheer, Adjunct Professor of Finance at Rotman and Director Emeritus of the ICPM, on "Integrated Reporting for Pension Funds"