

## **Hacking down disciplinary walls: Advancing sustainability and interprofessional competencies through a hackathon model**

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**Abstract:** The Calgary Interprofessional Challenge (CIC) engages university students across disciplines in a novel 44-hour hackathon based on faculty and peer-to-peer interprofessional education. CIC uses short introductory talks on problem-solving in different faculties, a series of workshops, and expert mentorship from university faculty, relevant specialists, and entrepreneurs as its core curriculum. A recent offering of CIC used the campus as a learning lab by focusing on a sustainability challenge at our university. The CIC model can be replicated at other campuses to advance sustainability, while cultivating interprofessional and sustainability practice competencies such as stakeholder engagement, group collaboration, and understanding of different worldviews and relationships.

**Keywords:** interdisciplinary, experiential learning, soft skills, co-curricular, design thinking, interprofessional education

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## **Introduction & Context**

While the Calgary Interprofessional Challenge (CIC) and Campus as a Learning Lab (CLL) have different geneses, 2018 presented both programs an opportunity to collaborate with the common goal of creating a campus-wide learning experience for University of Calgary students. CIC is a novel 44-hour co-curricular hackathon with a focus on developing interprofessional skills around a health-focused grand challenge. A hackathon is an event that brings together a broad collection of stakeholders over a short period to generate novel ideas and develop prototypes to address a particular problem. CLL is an initiative that seeks to provide experiential learning and applied research opportunities to enable students to use their skills and knowledge to address sustainability challenges on campus, thereby cultivating sustainability leadership competencies. By focusing the 2018 CIC on campus sustainability and health, we were able to achieve a number of desirable outcomes. First, we were able to build off the past successes and learnings of both the CIC and CLL to create a robust offering that focused on campus sustainability. Second, combining CIC and CLL worked to reduce “initiative fatigue” on campus; like most post-secondary campuses, the University of Calgary has several institutional strategies and a wide array of opportunities for students. By bringing together the two, we were able to create a higher profile for the respective initiatives. Third, by aligning the CIC and CLL, we were able to scaffold the expertise, resources, and experience of the organizers.

We present this case study to convey the possibilities of pairing two distinct initiatives to advance sustainability on campus and cultivate competencies in students. The structure of this article mirrors the evolution of the partnership between the Campus as a Learning Lab initiative and the Calgary Interprofessional Challenge. We begin by providing an overview of sustainability at the University of Calgary, with a focus on the Campus as a Learning Lab initiative. This includes a high-level synopsis of sustainability leadership competencies enshrined in our Institutional Sustainability Strategy. Next, we provide details on the need for interprofessional education in post-secondary institutions, the evolution of the Calgary Interprofessional Challenge, and its mechanics. Finally, we conclude with some reflections on the CIC and the potential to replicate this model at other institutions to cultivate student competencies while advancing sustainability on campus or in the community.

## **Sustainability at the University of Calgary**

The University of Calgary launched its Institutional Sustainability Strategy (ISS) in 2016. The ISS provides a roadmap for continuous improvement in pursuit of excellence and leadership in sustainability. It connects three interdependent frameworks: 1) Advancing Sustainability Education and Research; 2) Engagement for Sustainability; and 3) Sustainability in Administration and Operations (University of Calgary, 2016). While each framework is designed to stand alone, overlapping goals serve to integrate the frameworks into the conceptual whole. One of the goals of the ISS is to build competencies for sustainability leadership, and infuse and embed sustainability into the campus experience by utilizing our campus as a learning laboratory for applied learning in sustainability. Campus as a Learning Lab is one of the approaches used to connect the three frameworks enshrined in the ISS (Figure 1).



Figure 1: University of Calgary Integrated Practice Model for Sustainability (University of Calgary, 2016).

### Campus as a Learning Lab & Sustainability Leadership Competencies

Campus as a Learning Lab is focused on providing experiential learning and applied research opportunities to enable students to apply their knowledge and skills to solve sustainability challenges on campus. CLL is an approach that creatively uses new and existing educational resources and infrastructure as active, experimental environments for interdisciplinary learning and applied research and practice. In its simplest form, experiential learning means learning by doing, followed by a period of reflection on the experience to develop new skills, new attitudes, or new ways of thinking (Lewis & Williams, 1994). Experiential learning inspires personal and social action in ways that a formal classroom experience cannot always do, and it encourages students to apply theory and practice in equal measure (University of Calgary, 2016). Examples of past CLL projects include co-curricular student research on how food vendor patrons responded to a straw-free day; a course project on a sustainability assessment of all facets of the Graduate Student Association's restaurant; and creation of habitat for pollinators on campus through art installations for a Master of Fine Arts thesis project.

Educators, stakeholders, employers, and students are recognizing the need for transformational changes to the ways students are educated in sustainability; there is a need to shift from teaching

students *what* to think to *how* to think (Wiek & Kay, 2015). The ISS heeds this call and a complementary one put forward by Frisk and Larson (2011) to move beyond declarative knowledge about sustainability to also include procedural knowledge (awareness of how to undertake action or develop strategy), effectiveness knowledge (awareness of the influences of perceptions and beliefs on behaviors), and social knowledge (awareness of the influences of social norms). Further, competence in sustainability research means having the requisite knowledge, skills, and attitudes for performing tasks and engaging in problem-solving for real-world sustainability challenges and opportunities (Wiek, Withycombe, Redman, & Banas Mills, 2011). Based on this scholarly work, the ISS calls for the cultivation of six foundational competencies for sustainability practice including:

- Anticipatory thinking and long-term foresightedness;
- Empathy and understanding of different worldviews and relationships;
- Capacities for stakeholder engagement and group collaboration;
- Action-oriented leadership skills and change agency skills;
- Critical thinking and decision-making capacity within complexity; and
- Systems thinking and an understanding of connectedness.

Speaking broadly about sustainability professionals, Martin, Brannigan, and Hall (2005) state that employees require “softer” skills-- communication, leadership, and organizational-- that are challenging to teach in a formalized university setting. Further, the authors identify that there is a need for sustainability professionals with skills in interdisciplinary problem-solving instead of overly specialized scientific competence. The interdisciplinary nature of the Calgary Interprofessional Challenge provides a platform for developing the requisite skills for the next generation of sustainability professionals.

### Sustainability Meets CIC

The aim of the CIC is to enable interprofessional education through a health-focused challenge. Health can also be viewed through a sustainability-focused lens; the Sustainability Accelerator Network’s Sustainability Compass (2019) affords the inclusion of well-being as one of the four cardinal points of sustainability (Figure 2).

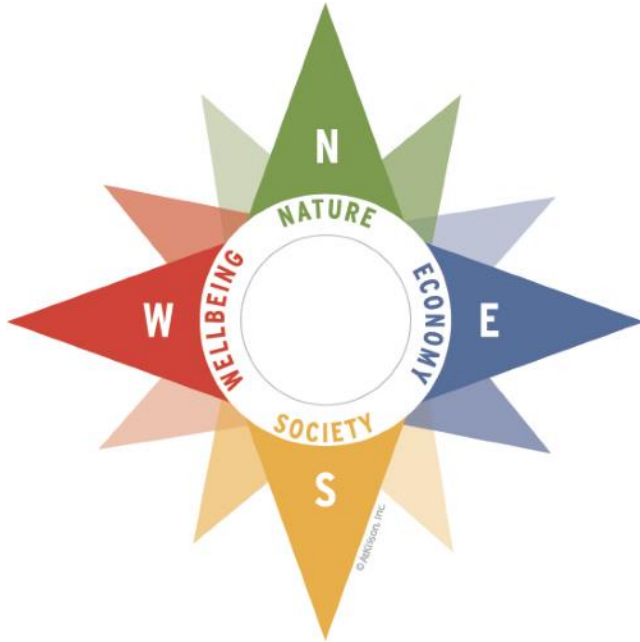


Figure 2: The Sustainability Compass (Sustainability Accelerator Network, 2019).

By framing the focus of the CIC on sustainability, we enabled the cultivation of sustainability leadership competencies, the provision of interprofessional education, and an opportunity to generate innovative ideas to advance sustainability on campus. The sustainability leadership competencies that were most cultivated by the CIC include: 1) capacities for stakeholder engagement and group collaboration; and 2) understanding of different worldviews and relationships.

We capitalized on an opportunity to use an innovative building redevelopment project on campus as a springboard for the CIC. The 2018 CIC was focused on how to design a sustainably healthy learning environment, with the inspiration of the MacKimmie Block. The MacKimmie Block is an administrative building currently under redevelopment on campus. The MacKimmie Redevelopment Project is striving to be one of the most energy efficient buildings on a Canadian post-secondary campus; to holistically support and enable the health, wellbeing, and comfort of the campus community; and to be a showcase for a rich diversity of experiential learning and applied research opportunities on sustainability in the built environment. This project is unique from other building projects on campus in that it is part of the Canadian Green Building Council's Zero Carbon Pilot Program (Canadian Green Building Council, 2019).

### **Interprofessional Education as the Impetus for CIC**

CIC was created to address the learning opportunities provided to students through multidisciplinary education, and to meet accreditation standards and expectations for University of Calgary medical students.

The Committee on Accreditation of Canadian Medical Schools (CACMS) standards and elements provide the framework by which Canadian medical schools are peer-reviewed and considered for CACMS and Liaison Committee for Medical Education (LCME) accreditation. CACMS accreditation standard 7.9 references interprofessional education (IPE), and specifically

discusses collaboration with students from other health professions in the provision of coordinated patient care. Similarly, Health Canada and the World Health Organization definitions of IPE center on students from health-related occupations. These approaches focus solely on direct patient care, which is only one role of healthcare providers. They do not consider the broader teams responsible for other facets of healthcare such as the design of the physical space patients function within, the medical devices and technologies they interface with regularly, or the regulatory policies and business practices that permeate every health-related practice.

There is a plethora of research demonstrating the benefits of multidisciplinary collaboration and hands-on learning. Student team members from each faculty can bring a fresh set of perspectives and access to new knowledge and high-quality learning experiences. For example, engineering students provide expertise for prototyping whereas marketing students can bring information about customer receptivity and product plans (Edmondsdon & Nembhard, 2009). These non-redundant sources of knowledge expand students' horizons and innovative abilities. In fact, in the setting of new product development, 70- 90% of firms use cross-functional teams that include specialists in engineering, marketing, and finance (Edmondsdon & Nembhard, 2009). Successful delivery of healthcare similarly relies on collaboration of cross-functional teams. For example, in primary care, doctors, nurses, and allied health professionals work together to achieve the best outcome for patients.

Increasingly, the responsibilities and boundaries of individual professions are overlapping (Parsell & Bligh, 1998). Therefore, it is important for learners to understand the complexities of working in a multiprofessional environment (Parsell & Bligh, 1998). Indeed, it has been shown that problem-based learning in a multidisciplinary group can enhance clinical decision-making by medical students (Nango & Tanaka, 2010). As an extension of this strategy to enhance learning, CIC was created to provide medical students with the opportunity to learn from other faculties such as business, environmental design, computing science, and engineering to improve ideation, product conceptualization, and the overall learning experience of the innovation-focused event.

### The Event

Two months in advance of the hackathon-styled event, we placed a campus-wide call to students to engage in CIC. In 2018, as in previous years, we accepted up to ten students from every faculty on campus, and purposefully sub-divided students into multidisciplinary teams of maximum six students each in advance of the weekend event.

The literature on the importance of teams “norming” is well documented (e.g., Tuckman 1965, Bettenhausen 1991). As short as the event might be, it is important to allow teams the opportunity to introduce themselves and get to know each other, without the pressure of the event looming over them. For our event, we were deliberate in not suggesting roles (i.e., designating a team leader, or who should attend expert workshops). These decisions gave team members a chance to speak up and take on roles that played to their strengths and interests.

Our events start with a brief speaker series, where we invite a representative from each faculty to present for a maximum of five minutes on “how we solve problems in our faculty.” Post-event

evaluations of past CIC events have found that students find this series to be incredibly valuable and eye-opening, as they do not realize that those from different faculties have such differing approaches to solving problems. Immediately after the series, we reveal the problem that the students are to work on over the Friday evening to Sunday afternoon event.

With an aim to minimize didactic “teaching” sessions, we have focused on workshops to provide students with the baseline knowledge they might apply to their solutions during the event. There are only two mandatory workshops attended by all participants. One is on design thinking on the initial Friday evening, meant to provide students with an approach to problem-solving. The second is a “pitch clinic” on Saturday night, aimed at helping students organize and communicate their solutions for presentation and judging on Sunday.

We also arrange optional workshops that give students and teams agency, an opportunity to do a deep-dive into a particular topic area related to the challenge, and allow an opportunity for peer-to-peer education. These 30-minute, Saturday morning workshops occur concurrently, and allow students within each team the opportunity to choose a workshop of particular interest to them. Our only stipulation is that students not attend a workshop being delivered by someone from their own faculty, but experience an expert-facilitated session from another faculty. Students then reconvene with their groups, teaching each other what they learned from their sessions, and applying that new knowledge to their projects.

On Sunday, we culminate our event with a pitch competition. Judges are recruited from across our university and city, and are provided with a broad rubric to evaluate the ideas generated by each team. Unlike most hackathons, our ultimate goal is to engage students in meaningful interprofessional education, and the creation of products or prototypes is secondary. Judges present feedback and award teams with “winning ideas,” alongside a Student’s Choice award voted on by all participants. Prizes include support for students and teams to continue their interprofessional education through courses and opportunities to work with professionals to develop their ideas.

### **Reflections & Conclusion**

The 2018 edition of the CIC marked its third offering. CIC started in 2016 with 38 students from seven faculties. We grew to 65 students from ten faculties in 2018 and again in 2019. Over the past three years, over 160 students have participated from diverse faculties including environmental design, engineering, science, medicine, nursing, law, business, education, and the arts. Based upon our experience with this model to-date, we have found it to be an effective vehicle for cultivating interprofessional and sustainability leadership competencies.

Here we share what we believe to be some of the CIC’s most significant successes, challenges, and opportunities. These insights are based on our observations of the hackathon and written feedback from students following the CIC, and could prove helpful to those looking to create a program modelled after CIC.

#### Successes:

- Sustainability and health are broad and common paradigms, with enough shared aims and goals for students from any faculty to engage during an event focusing on both domains. Our ability to recruit judges from across campus and the city demonstrates that sustainability and health similarly resonate with community members.
- The weekend hackathon model works from a logistics perspective, as organizing an event to accommodate the varied and disparate schedules of students from so many faculties during the week would be impossible. It also allows us to recruit working professionals to be mentors and judges.
- While admitting that it came with challenges, students reported that they appreciated the opportunity to work with students from other faculties, being exposed to new ways of thinking and problem-solving, and learning from people from other disciplines.
- Every team successfully pitched an idea at the end of the event, demonstrating pre-arranging students into groups from different faculties created teams that were able to learn and work together over a short period. This replicates the environment students will most likely find themselves in during their professional careers.
- Students are incentivized by the opportunity to learn and participate in the event for itself, not by the promise of reward. We do not market the event with mention of any specific prizes.
- The student teams created diverse project results including: the creation of fresh food vending machines; sustainable and adaptable learning spaces and modular furniture; sleeping pods; and technology to capture energy from building occupants' footsteps to power the building. This range of responses helped to further students' understanding of sustainability coupled with health and the scale at which interventions can be designed.

#### Challenges & Opportunities:

- We experienced attrition from student signups to actual participants. This has been a challenge since the first offering of the CIC. We are planning to host future offerings earlier in the semester in hopes that students will have more time to participate prior to the onset of mid-terms and other commitments that mount as the semester progresses.
- The CIC takes a significant investment of time, funding, and energy to bring it to fruition. How can we ensure the longevity and sustainability of this initiative? The organization of the event hinges on the participation of faculty members who have myriad other commitments and obligations.
- The interdisciplinary nature of the event entails the creation and function of an interdisciplinary planning committee. Honoring interdisciplinarity in organizing the event exemplifies the spirit of the CIC and leads to a richer learning experience for students but comes with associated challenges. For example, committee members hail from numerous faculties on campus making something as simple as finding a common time and convenient location to meet a challenge.



- Measuring learning outcomes of the CIC is challenging. We currently rely on a self-assessment completed by participants at the close of the hackathon. A self-assessment completed immediately after the learning event does not provide students with the time and space to consider and understand both knowledge and competencies that they may have gained during the CIC. Incorporating critical reflection in applied learning with Ash and Clayton's DEAL Model (2009) could be an opportunity to push students to explore their learning in a more critical and structured way.
- Further, students may not identify competencies they developed through CIC until they enter the workplace. Reconnecting with CIC participants several years after their involvement to engage in a longitudinal assessment could unearth interesting findings about student learning outcomes and potential improvements to the CIC.
- Is it possible to grow this initiative beyond the University of Calgary so that students can engage in developing interprofessional and sustainability competencies with students from other post-secondary institutions? What are the merits of expanding the program in this way? Similarly, would it be possible to realize the participation of additional institutions through a blended model with students participating in an online fashion in real-time? What would be the merits of expanding the program in this way?
- Although the heart of the CIC is about developing competencies, how can organizers shift the hackathon to a place where solutions are implemented? Further, how can implementing solutions be used as a means to enable continued learning and cultivation of interprofessional and sustainability leadership skills?

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**Calgary Interprofessional Challenge participants 2018 - Credit: Connie Yang**