

UNIVERSITY OF CALGARY | Taylor Institute for Teaching and Learning

Undergraduate Research Initiative (URI) Report

2020-21

Prepared For: Drs. Leslie Reid, Natasha Kenny, Lisa Stowe

Prepared By: Rachel Braun, Dr. Kyla Flanagan, Joanne Fung, Kara Loy, Dr. Lisa Stowe



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EXECUTIVE SUMMARY

In this report, the Undergraduate Research Initiative (URI) Team summarizes the objectives, activities, and impact of the URI's three signature programs from January 2020 to December 2021. These insights were collected over two years of program evaluation research. In this time, the College of Discovery, Creativity, and Innovation's (CDCI) Undergraduate Research Initiative (URI) has supported **over 1,660 undergraduate students conducting research** at the University of Calgary. We have focused on building high-quality undergraduate student research experiences that intentionally evoke students' *curiosity*, engage students in the process of *discovery*, ensure there is an opportunity for students to *disseminate findings*, and extend student learning through *critical reflection*. These experiences have been in curricular course-based undergraduate research, non-curricular undergraduate research, undergraduate research events, engagement, and outreach.

The Undergraduate Research Initiative (URI) Programs

The URI comprises three signature programs. Each initiative provides undergraduate students with a unique path to engage in undergraduate research:

- **Program for Undergraduate Research Experience (PURE):** PURE provides individual students with up to \$6,000 of financial support to undertake an 8, 12, or 16-week research project conducted between May and August. Entry into the program is via a competitive application process, where a student partners with a research supervisor to develop a research proposal collaboratively.
- **Course-Based Undergraduate Research Experience (CURE):** Course-based Undergraduate Research Experiences (CUREs) include a meaningful research or discovery project embedded in the curriculum of a for-credit course. A CURE can encompass any field of study and nearly any undergraduate course, even large classes and remote learning contexts. CUREs make research highly accessible by expanding research opportunities to all students enrolled in a course.
- **UNIV: Research on Global Challenges:** Students explore solutions to global challenges by conducting research within a project stream under the mentorship of a faculty supervisor and in collaboration with the UNIV course instructor and research coaches. Students develop research skills with an interdisciplinary cohort of students while investigating wicked problems related to the UN Sustainable Development Goals.

Key Findings

Program for Undergraduate Research Experience (PURE)



2020

- \$765,000 total funds
- \$70,500 Faculty-funded awards
- 137 students and 122 supervisors from 10 units

2021

- \$849,000 total funds
- \$144,000 Faculty-funded awards
- 151 students and 135 supervisors from 10 units

We have seen steady growth in the number of PURE applications each year and dramatically increased the number of faculty-funded opportunities, doubling the number from 2020 to 2021. Students have reported gains in their research skills, reflected on their identity as researchers, and developed a sense of belonging to a research community. We continue to share PURE's success across campus, with 10 UToday stories, an impactful Celebration of Achievement, and the cultivation of cross-campus relationships. We are committed to continual growth, having developed new workshops, the Research Skills Foundation micro-credential badge, and the Graeme Bell Travel Award.

Course-based Undergraduate Research Experiences (CURE)



- 1,280+ students from across 8 courses
- 11 instructors from 5 faculties
- 11 research coaches
- 9 community partners

In Fall 2020, we launched the CUREs program. In just over a year, we have seen substantial uptake by instructors in eight redesigned CURE courses, with a total of 11 instructors and 11 research coaches. The innovation and outreach of CUREs resulted in over 1,280 students having a research experience. The accessibility of the CUREs model maximizes the number of students who can get involved in research earlier in their undergraduate careers. As we have seen with the ongoing global pandemic, the CUREs model is applicable to remote, blended and in person offerings. Several CURE instructors have been given awards associated with their CUREs. In addition, three CURE courses have collaborated with nine community partners, including the City of Calgary, Eco Trust, and the Calgary Humane Society.

Research on Global Challenges (UNIV)



UNIV 401 (Winter 2021)

- 4 research streams
- 42 students
- 4 research supervisors
- 4 research coaches
- 1 community partner

UNIV 302 (Fall 2021)

- 5 research streams
- 52 students
- 5 research supervisors
- 5 research coaches
- 1 community partner

Research on Global Challenges piloted a course structure that produced tangible outcomes for students and research supervisors. Over 90 students developed effective interdisciplinary teamwork and problem-solving skills in collaboration with faculty mentors, community partners, and like-minded peers. For example, UNIV students in the “Indigenous Experiences with Police” stream developed a research project with Portland Committee on Community-Engaged Policing. The unique structure of the class facilitated students’ investment in their research topic and skills development. Student outcomes saw the greatest gains in their “understanding of how researchers work on real problems,” “understanding of the research process,” and interdisciplinary research skills. Supervisors reported taking a more exploratory approach to research and mentorship. In the future, supervisors would like to explore interdisciplinary collaborations even more. In addition, two UNIV instructors were acknowledged with prestigious Killam awards for work associated with their UNIV experience.

Equity, Diversity, and Inclusion (EDI) and Indigenous Engagement

In 2021, we created an **EDI Action Plan** for the PURE Award to address the accessibility of undergraduate research. The EDI Action Plan concluded with 22 recommendations for improving the accessibility of PURE. These recommendations are aligned with the University of Calgary’s [ji’ taa’poh’to’p, Indigenous Strategy](#), the Office of Equity, Diversity, and Inclusion’s mission, and the EDI practices summarized in the [Research and Teaching Awards Pilot Plan](#) to “ensure nominators, nominees, and selection committee sees and recognizes excellence in diverse forms.”

What’s Next

We aim to expand our support of high-quality undergraduate research and experiential learning opportunities at UCalgary, making research more accessible for students and building relationships with units across campus. Key action items include expanding the *Research Skills Foundations* badge beyond PURE students, continuing to integrate EDI and Indigenous Engagement practices and principles in our programming, and exploring ways to use Elevate and the Experiential Learning catalogue to increase visibility and access to undergraduate research opportunities.

INTRODUCTION

The College of Discovery, Creativity, and Innovation (CDCI) leads the **Undergraduate Research Initiative (URI)** at the University of Calgary. The URI seeks to advance undergraduate research across campus by providing multiple entry points for students to access research opportunities. Undergraduate research greatly contributes to the [Academic](#) and [Research](#) Plans by enhancing student experience and impact, driving innovation through teaching and research integration, increasing research capacity, and connecting communities. As part of the integrated model of the Academic and Research Plans, the URI aims to *Facilitate Interdisciplinarity* (Priority 3.1) through interdisciplinary teaching, research, and learning and promote institutional frameworks for developing interdisciplinary curricula and curriculum design. The CDCI also takes directive from the Academic Plan to “refine and scale up the offerings of the College of Discovery, Creativity and Innovation (CDCI)” and “explore additional opportunities for course credits for undergraduate research experience” (Priority 3.4).

In all undergraduate research experiences supported by the CDCI, students learn about research by doing research. This “learning by doing” is captured as one of the categories of Experiential Learning defined in the [Experiential Learning Plan \(2020-25\)](#), *Research-Based Experiential Learning*, where students lead or contribute to a research project. The Experiential Learning Plan establishes a target of all undergraduate students participating in at least two Experiential Learning opportunities. The work of the CDCI supports the *Experiential Learning Plan* by expanding capacity, reducing barriers, and increasing opportunities for students to participate in research.

In this report, the URI Team explores the objectives, activities, and impact of the URI’s three signature programs for January 2020 to December 2021. We begin by situating the URI within the broader undergraduate research landscape at UCalgary. Next, we dedicate a section to each URI program to explore their unique impacts on participant outcomes, from students to supervisors, instructors, and graduate research coaches. These insights are the product of two years of program evaluation research. Throughout each section, we integrate evidence from program evaluation research with storytelling. Next, we outline the Equity, Diversity, and Inclusion (EDI) Action Plan developed in 2021 that identified ways to improve equity and access, focusing on PURE. The EDI Action Plan concluded with 22 recommendations for improving the accessibility of PURE. We close with what’s next for each of our signature programs.

Undergraduate Research Initiative (URI)

Undergraduate research is a mentored investigation involving a researchable question or questions conducted by an undergraduate student or group of students. It can result in an original contribution to a field of knowledge or provide an opportunity to substantially develop students' autonomy and skills in conducting research, scholarship, or creative expression. In the CDCI, we have focused on building high-quality undergraduate research experiences that intentionally evoke students' *curiosity*, engage students in the process of *discovery*, ensure there is an opportunity for students to *disseminate findings*, and extend student learning through *critical reflection* (Figure 1).

The URI focuses on three broad spaces where undergraduate research occurs in partnership with campus units, including the Provost, Vice-President (Research), and the Vice-Provost (Teaching and Learning) portfolios:

- **Curricular course-based undergraduate research:** Curricular undergraduate research experiences are academic courses that have been designed to include a significant research component. Here, our focus is to explore incorporating research into the curriculum for high enrolment first- and second-year courses.

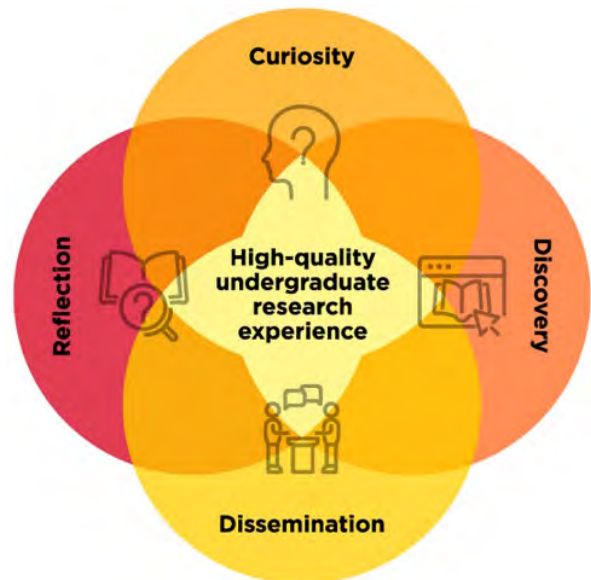


FIGURE 1 THE URI FRAMEWORK

- **Non-curricular undergraduate research:** Non-curricular undergraduate research experiences include programs and activities outside of academic courses. In our context, it includes the Program for Undergraduate Research Experience (PURE), resource development, micro-credentials, workshops and more.
- **Undergraduate research events, engagement, and outreach:** These events and activities engage students in undergraduate research and celebrate their success. Examples include hackathons, boot camps, festivals, and undergraduate research symposiums.

We developed our URI framework and strategy based on an extensive body of literature on undergraduate research. We have taken the evidence-based practices and scholarship from the literature and integrated them with the UCalgary campus context, Experiential Learning Plan, and our team’s mentorship experiences with undergraduate research. The CDCI develops undergraduate research by:

- **Building networks and sharing knowledge:** Build and network connections with faculty members and units across campus, including a web presence and an undergraduate research portal.
- **Developing resources and programs:** Develop undergraduate research experience learning resources and programs, including open-access research videos, a faculty guide, a community of practice, workshops, and micro-credentials.
- **Delivering curricular and non-curricular undergraduate research experiences:** Deliver a revised *Research on Global Challenges* course and support an increasing number of course-based undergraduate research experiences across multiple faculties.
- **Engaging with community partners:** Nurture opportunities for community-integrated undergraduate research. Maximize undergraduate research impact on local, national, and international communities.
- **Communicating impact:** Evaluate and communicate the value and impact of undergraduate research across programs and activities. Recognize and celebrate faculty and student achievements and collaborations with industry, community, and other external partners.
- **Reducing barriers and increasing access:** Identify and reduce the potential barriers to accessing undergraduate research at UCalgary, particularly those experienced by underrepresented-identifying students, such as women and gender non-conforming identities, Indigenous persons, racialized minorities, 2SLGBTQIA+, and persons with disabilities.

Undergraduate Research Landscape at UCalgary

National Survey of Student Engagement (NSSE)

The 2020 NSSE quantitative and qualitative findings show that students perceive that undergraduate research greatly impacts their learning and contributes to developing high-impact competencies like teamwork, skills acquisition, collaboration, and solving real-world problems. In the qualitative feedback, when students are asked to describe their most significant learning experience, the second most frequent student comment from those that responded to NSSE was about undergraduate research, with the most frequent comment relating to skill development. Through NSSE’s qualitative comments it was revealed that working on a research project with a faculty member allowed many of the undergraduate student respondents to see themselves as future researchers. One student shared:

“The most significant learning moment I have had so far is conducting my own research project. I’ve been able to complete all the skills that I have developed throughout my degree, and I am able to put them to use while answering my research question. It is effective because it prepares me well to do research in the future” – NSSE 2020 Respondent

Students see undergraduate research as an impactful activity. The NSSE quantitative results show that of those who responded, many first-year students plan to participate in a research project, with **41%** of students reporting that they intend to participate in research with a faculty member. However, only **24%** of students report doing so by their fourth year. These results suggest there may be a gap in student accessing and completing undergraduate research opportunities. Many students recommended more opportunities to engage in undergraduate research in their first or second year.

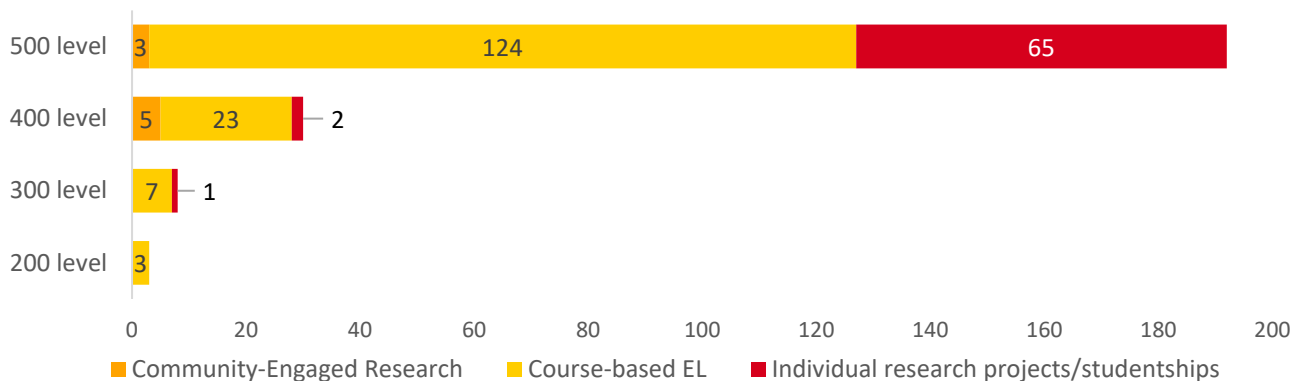
Undergraduate Research in the Curriculum at UCalgary

The Office of Experiential Learning (OEL) collaborates with the UCalgary community to understand the types of EL occurring across campus. In 2020, the OEL began conversational interviews with Associate Deans, Teaching and Learning, Department Heads, and Program Directors to learn more about EL, including undergraduate research, in their faculties, departments, and programs.

To date, the team has compiled a list of over 1,185 EL courses from six faculties. From the EL courses examined, 233 (19.6%) have been identified as having a significant research-based EL component, including community-engaged research, course-based research projects, or individual research projects/studentships. While there is much more to learn about undergraduate curricular research happening across campus, so far, we see two characteristics for undergraduate research-based EL at UCalgary (Figure 2):

- The vast majority (93%) of the curricular research opportunities occur at the 400- and 500-levels
- 65% of the opportunities are course-based research projects, with fewer individual research projects (28%) and a very small proportion (3%) of opportunities involving community-engaged research

FIGURE 2 EL IN THE CURRICULUM: WHAT WE'VE HEARD ABOUT RESEARCH-BASED EL SO FAR

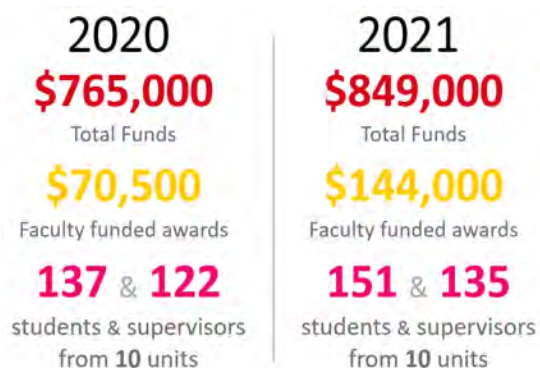


UCalgary undergraduate students have a strong interest in conducting research during their program. For those students who have research experiences, the impact on their learning can be powerful as demonstrated in students' qualitative comments in the 2020 NSSE data. With curricular research opportunities typically occurring later in a student's degree program and many students not conducting research despite having indicated interest at the start of their academic journey, part of the URI mandate is to provide research opportunities for students interested in research earlier in their program.

Our programming supports multiple pathways for students interested in research to access high-quality research opportunities throughout their program. In doing so, students develop research skills throughout their degree, and faculty and staff grow a shared understanding of what constitutes undergraduate research skill development across disciplines and years of study. In the following sections, we describe and explore the impact of each of the three signature undergraduate research programs offered by the CDCI.

PROGRAM FOR UNDERGRADUATE RESEARCH EXPERIENCE (PURE)

For more than ten years, the Program for Undergraduate Research Experience (PURE) has provided immersive, experiential, hands-on research opportunities for undergraduate students to collaborate with University of Calgary Faculty members. PURE provides individual students with up to \$6,000 of financial support to undertake an 8, 12, or 16-week research project conducted between May and August. Entry into the program is via a competitive application process, where a student partners with a research supervisor to develop a research proposal collaboratively.



Since 2018, the Provost (Vice-President Academic) and Vice-President (Research) offices have provided equally matched funding for PURE as a unique program that profoundly contributes to the Academic Plan's goals of enhancing student experience and impact, driving innovation through teaching and research integration, and connecting communities. Two additional experiential learning programs are affiliated with PURE: the **Research Skills Foundations Badge** and the **Graeme Bell Travel Award (GBTA)**. The Research Skills Foundations Badge is a micro-credential that recognizes students' participation in and reflection on PURE workshops and activities. The GBTA provides funding to students travelling to disseminate their PURE Research (modified in 2020 to support *virtual* conferences or symposiums).

Students apply for PURE through a Consolidated Application System (CAS), where they submit *one* application per academic year and are considered for *many* undergraduate research awards of the same value. Collectively, these awards, including PURE, are known as the **Undergraduate Research Awards** or the **Summer Studentship Awards**. The program application and allocation processes are administered in partnership with the Cumming School of Medicine and the Research Services Office. Over the years, the CAS has been designed by UCalgary IT specialists to meet each award's unique eligibility and adjudication criteria. The automation of eligibility criteria and ability to evaluate applications within the CAS has substantially streamlined the award allocation process. This collaborative effort allows as many students as possible to receive an undergraduate research award while minimizing the administrative load. We are excited to announce that the award amount has increased to \$7,500 for 2022.

Program Outcomes

PURE's program outcomes fall across four learning bundles: research skills, research identity, career goals, community building (Table 1). See Appendix A for detailed learning outcomes.

TABLE 1 PURE AWARD LEARNING OUTCOMES

LEARNING BUNDLE	LEARNING OUTCOME
Research Skills	<i>Develop</i> a research plan, <i>identify</i> a specific area of inquiry, <i>assess</i> the viability and suitability of research practices, <i>carry out</i> the research plan and <i>communicate</i> research findings
	<i>Collaborate</i> with other researchers in designing, planning, and implementing a research project
	<i>Describe</i> the importance of your research to communities on- and off-campus; effectively <i>communicate</i> the value and impact of your research and conclusions to various audiences
Research Identity	<i>Reflect</i> on and <i>articulate</i> the impact of the PURE research experience on research skill development and researcher identity
Career Goals	<i>Reflect</i> on and <i>articulate</i> the impact of the PURE research experience on academic and professional growth and career goals
Community Building	<i>Establish</i> and <i>participate</i> in a community of scholars, <i>developing</i> a network of undergraduate, graduate, and faculty researchers across campus and beyond

We support students meeting these learning outcomes through a PURE student orientation and a series of summer research skills workshops. In 2020, we had 517 participants at the orientation and six summer workshops. In 2021, we had 423 participants at the orientation and five summer workshops. We also host a PURE supervisor orientation at the start of term – typically, about 50% of PURE supervisors attend the orientation. See Appendix B for the summer research skills workshop series.

We created the **Research Skills Foundation Badge** to recognize and celebrate students' participation in PURE workshops. This optional micro-credential provides students with an opportunity to articulate their research skills developed through PURE programming in a sharable, portable, digital way. Participants chose four workshops or events to attend and reflect on for badge submission and credit, based on their areas of interest and desired research skills development. In 2021, 29 (19%) out of 151 students earned this elective micro-credential, a small increase from the previous year when 24 (18%) out of 137 students earned the badge. While this badge is only in its second year, we are already seeing its impact on PURE students' learning and engagement throughout their award.

Lastly, the **Graeme Bell Travel Award (GBTA)** provides financial support to PURE student researchers interested in travelling to conferences or symposiums to share their research findings. The award was modified in 2020 to allow for virtual conferences and symposiums and returned to a travel award for the 2021 PURE cohort. In 2020, three students received the GBTA, followed by two students in 2021. One student shared this testimonial:

"Presenting at the annual meeting of the International Neuropsychological Society was a remarkable experience! With the support of my supervisors and PURE, I had the opportunity to travel to America and learn about interdisciplinary approaches in healthcare within the field of neuropsychology. As an oral presenter, I also had the opportunity to develop effective communication and presentational skills while enhancing social networks with doctors and Ph.D. students from around the world, all through the incredible support of the GBTA" – GBTA student

Applicants and Recipients

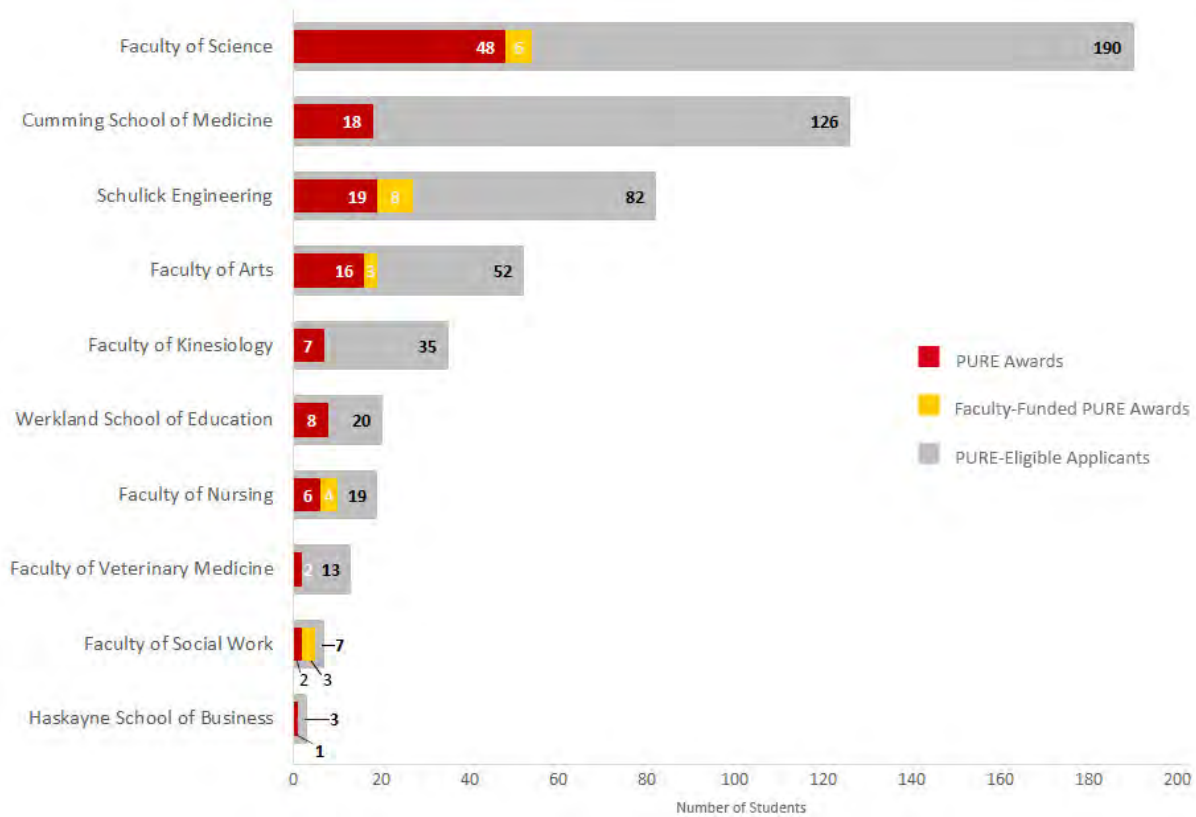
In 2021, PURE supported the research of 151 students and 135 supervisors between May and August. A total of 547 students applied for PURE in 2021, a record number for the program. The number of applicants increased by 6% relative to 2020, consistent with the growth in applicants realized since 2015. In 2021, PURE applicants' overall success rate, including Faculty-funded awards, was 28% (Figure 3).

FIGURE 3 NUMBER OF PURE APPLICANTS AND RECIPIENTS (2015-2021)



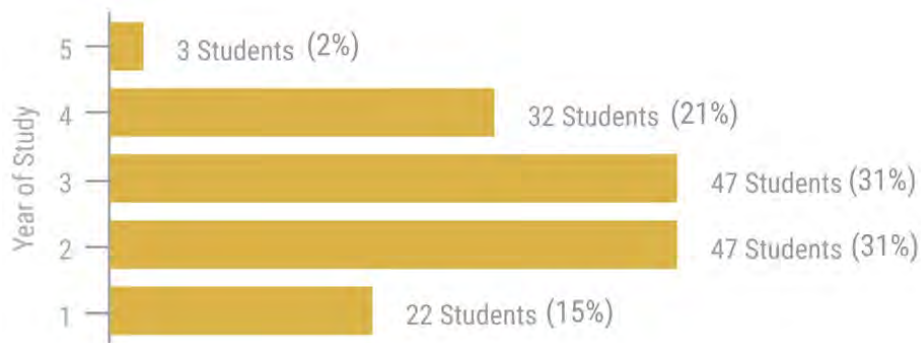
PURE is funded primarily by the Provost and Vice-President (Research). The PURE team also supports *Faculty-funded* PURE awards allocated to students within the respective Faculty. In 2021, we received \$144,000 from Faculties. With these funds, we were able to support 24 students in addition to the awards supported by the Provost and Vice-President (Research). The Schulich School of Engineering has a partnership model where additional PURE awards are supported 50% by the faculty and 50% by the research supervisor. The number of applicants, recipients, and faculty-funded awards for each academic unit is shown in Figure 4.

FIGURE 4 PURE APPLICANTS AND RECIPIENTS BY ACADEMIC UNIT IN 2021



Consistent with previous years, most 2021 PURE students reported being in their third (31%) or fourth year (31%). Of note, 15% of students reported being in their first year (Figure 5). For more than half of the students in PURE, this is their first research experience.

FIGURE 5 PURE RECIPIENTS' YEAR OF STUDY IN 2021



Lastly, the majority (83%) of PURE students apply for a 16-week research term, with 9% and 8% of students conducting 12- and 8-weeks of research, respectively.

Impact

Each PURE Award provides a unique opportunity for a student to develop a research plan, collaborate with other researchers, and communicate the impact of their research to diverse audiences. To evaluate the impact of the PURE program on student learning, we collect feedback at the start and end of the term through entry and exit surveys for both students and supervisors. The purpose of this evaluation research is to learn what students gain from their PURE Award experience concerning the program's learning outcomes. Completing these surveys is optional, and findings are used for continuous program learning and innovation.

Student Outcomes

Student survey results provide evidence of the positive impact of the PURE Award on student learning and experience at UCalgary. These data evidence that PURE is a transformative experience regarding student **research skills** and **research identity**. In synthesizing two years of PURE evaluation research findings, we see two prominent characteristics in many students at the start of the PURE term. First, faculty and mentor recommendations and encouragement greatly impact students' motivations to apply for PURE. In 2021, 42% of students reported hearing about PURE from a faculty member, down from 49% in 2020. Second, over half of the students (56% in 2021) report no prior research experience, with 46% of students entering PURE in the first (15%) and second (31%) year.

Allison Cormier. PURE Award Recipient (2020 and 2021), Department of Psychology

"I received my first PURE Award in 2020, where I researched individual differences in online learning. After taking a clinical psychology course, I knew I wanted to explore clinical research. In 2021, I received my second PURE Award, where I researched the socialization of pain in popular media. My PURE Awards have had a domino effect in my personal and professional spheres. I still work with my 2020 PURE supervisor on research projects, and I will be completing my honours thesis with my 2021 PURE supervisor. When I reflect, what stands out the most is how much I've grown. It didn't happen in one moment, but as an accumulation of moments where I was challenged to push myself and adapt to new circumstances. Today, I am always looking to further my learning outside the classroom. There is something special about diving into a unique area in your field and being the one seeking (or creating) answers."



**FIGURE 6 ALLISON CORMIER.
IMAGE PROVIDED BY ALLISON
CORMIER.**

Students estimate their research skills in several areas at the start of their PURE research in the student entry survey. In 2021, most students estimated their skill levels between "a moderate amount" and "a great deal" (Figure 7). These estimates are consistent with the 2020 survey findings. In the exit survey, we ask respondents to estimate the extent to which PURE improved their research skills. Most 2021 students estimated their skill levels had increased between "a great deal" and "extensive." The increase in reported research skills is consistent with the 2020 survey findings (Figure 8).

These amplified research skills led to many students' new or increased understanding of their research identity. In the student exit survey, we asked students to reflect on how their identity as a researcher has changed because of PURE. Throughout, respondents' reflections described changes in their identity based on the opportunities PURE provided them, the knowledge they gained from their PURE experience, the shifts in their self-understanding, and the increased sense of self-confidence in their knowledge, skills, and abilities. The nature of these changes varied, from amplifying the skills required to conduct research, to broadening or narrowing their research interests. The benefits of changes to research identity were diverse, ranging from gaining a newfound sense of confidence in research as an interest (broadly), to confirming long-held interests in research in their future (e.g., graduate school and career interests and goals).

FIGURE 7 PURE ENTRY SURVEY: GIVE AN ESTIMATE OF YOUR CURRENT LEVEL OF RESEARCH SKILLS IN THE FOLLOWING AREAS (N=102)

Question	None (%)	A Little (%)	A Moderate Amount (%)	A Great Deal (%)	Extensive (%)
Ability to read and understand the primary literature	0.0	5.9	45.1	37.0	11.8
Ability to work independently	0.0	2.9	24.5	52.0	20.6
Ability to analyze data and other information	0.0	10.8	42.2	35.3	11.8
Ability to integrate theory and practice	0.0	13.7	44.1	37.3	4.9
Skill in the interpretation of results	2.0	11.8	46.1	30.4	9.8
Understanding of the research process	1.0	15.8	47.5	24.8	10.9
Understanding of ethical conduct in your field	2.0	14.0	31.0	42.0	11.0
Understanding techniques and research methods in your field	2.9	20.6	50.0	20.6	5.9
Understanding how researchers work on real problems	3.9	19.6	50.0	19.6	6.9

FIGURE 8 PURE EXIT SURVEY: GIVE AN ESTIMATE OF THE EXTENT TO WHICH PURE IMPROVED YOUR ABILITY IN THE FOLLOWING AREAS (N=68)

Question	None (%)	A Little (%)	A Moderate Amount (%)	A Great Deal (%)	Extensive (%)
Ability to read and understand the primary literature	0.0	2.9	30.9	44.1	22.1
Ability to work independently	0.0	1.5	17.7	48.5	32.4
Ability to analyze data and other information	0.0	7.4	22.1	50.0	20.6
Ability to integrate theory and practice	0.0	4.4	35.3	41.2	19.1
Skill in the interpretation of results	0.0	4.4	41.2	36.8	17.7
Understanding of the research process	0.0	1.5	31.3	43.3	23.9
Understanding of ethical conduct in your field	1.5	10.3	22.1	39.7	26.5
Understanding of techniques and research methods in your field	1.5	1.5	34.3	43.3	19.4
Understanding how researchers work on real problems	0.0	1.5	29.9	52.2	16.4

“Before my PURE experience, I knew I was broadly interested in mental health promotion however, through my PURE project, I became specifically interested in the intersection of gender and mental health. I feel that I have a clearer idea of the population I want to work with in the future and what kind of research I would be interested in in the future (such as during graduate school). Furthermore, before PURE, I thought I was more interested in conducting quantitative research, but through my literature reviews and study of qualitative methods, I realized how important qualitative research is and want to conduct more qualitative work in the future.” – PURE 2021 Student

“I would say that my research identity started to be developed thanks to the PURE program. My previous research experiences mainly involved analyzing literature and theorizing from it. In contrast, my PURE experience involved humans and analyzed the practical applications of it. This experience gave me the opportunity to look inward about how I want to be identified within the knowledge community (from pronouns to background), and it helped me to better understand what sort of skills I have and what needs to be developed further.” – PURE 2021 Student

Supervisor Outcomes

The core of the PURE experience is the student and supervisor relationship. Supervisors act as mentors, guides, and supports to inspire and engage students as the next generation of researchers. In synthesizing two years of PURE evaluation research findings, we see parallel positive impacts for PURE supervisors. PURE supervisors report four benefits of supervising a PURE student:

- gaining supervision and mentorship experience (particularly before supervising a graduate student),
- advancing current research interests,
- exploring new research interests, and
- expanding their research team.

In the supervisor exit survey, we ask supervisors to share how they would describe the experience of supervising a PURE student to a colleague. Across responses for both 2020 and 2021, the top three themes were:

- PURE as a "great opportunity" to work with an enthusiastic student and to expand your research team and interests,
- PURE students are "highly motivated," and "exceptional," and
- PURE is a well-run and worthwhile program that provides valuable funding.

Dr. Ariane Cantin. PURE Supervisor (2021), Department of Biological Sciences

"For me, undergraduate research is about collaborating with students. They have a lot of great ideas and see connections I wouldn't necessarily see. I had never supervised a PURE student before, but Mackenzie was very convincing in wanting to work with me and in finding a water issue in Calgary that was of interest to them. We connected with a wetlands specialist and reviewed the literature. There hadn't been much research on wetlands in city water systems, and Mackenzie was interested in invertebrates, often used as indicators for water quality in an ecosystem. We reached out to Mount Royal University and the City of Calgary to piggyback our research project on data previously collected. As a PURE supervisor, I learned to let students have time to think for themselves, rather than me telling them what I would do. I've started doing this in my courses, too. I really want to work together with students to find answers and take a reflective approach to the research process."



FIGURE 9 DR. CANTIN AND MACKENZIE DOING FIELD RESEARCH ON CAMPUS. PHOTO PROVIDED BY A. CANTIN

Program Storytelling and Recognition

At the end of each PURE Award, the PURE Celebration of Achievement offers an opportunity to commend the work of PURE supervisors and students alike. The 2020 and 2021 events were hosted remotely, with presentations by the Provost, Vice-President (Research), and Vice-Provost (Teaching and Learning).



Link: <https://bit.ly/3xBOFM4>



Link: <https://bit.ly/3loi7QK>

In 2020 and 2021, PURE students were featured and celebrated in multiple **UToday stories**:

- "PURE award recipient explores how LGBTQ2S+ youth are faring during the pandemic" ([link](#))
- "Survey says: When it comes to anti-racism, we reflect more than we act" ([link](#))
- "Once upon a time in Forest Lawn" ([link](#))
- "Most of the microplastics in Calgary's wastewater come from biosolids, student research finds" ([link](#))
- "PURE award recipient explores how LGBTQ2S+ youth are faring during the pandemic" ([link](#))
- "Undergraduate awards provide experience beyond the classroom" ([link](#))
- "Award ignites UCalgary student's interest in studying accessible mobility on post-secondary campuses" ([link](#))
- "Undergrad students spend summer working with Indigenous Youth" ([link](#))
- "From pandemic data storytelling to topographical brain maps, PURE undergrad researchers are at the forefront of digital media transformation" ([link](#))
- "Nursing students benefit from 2020 PURE studentships" ([link](#))

COURSE-BASED UNDERGRADUATE RESEARCH EXPERIENCE (CURE) PROGRAM

A course-based undergraduate research experience (CURE) is when a fulsome research or discovery experience is incorporated into the curriculum of a for-credit course. **A CURE can encompass any field of study and nearly any undergraduate course, even in large classes and remote learning contexts.** CUREs allow *all* students enrolled in the course access to a research experience, thereby eliminating many barriers to research opportunities experienced by students while also ensuring access to high-quality research experiences.

The CDCI supports course instructors in developing a CURE in a new or existing course. Partnering with the CDCI includes:

- Educational development support from Kara Loy (Educational Development Consultant: Experiential Learning & Undergraduate Research) to consider and adapt evidence-based practices for fostering high-quality student research-focused learning outcomes and activities
- Inclusion as part of a community of practice with other course instructors implementing CUREs
- Inclusion in a comprehensive evaluation plan to explore CURE impact and best practices

Faculty, staff, and students participating in CUREs with high student enrolment can also receive support from one or more **research coaches**, who can facilitate CURE components during the term. A research coach is a graduate or upper-level undergraduate student with research experience who can dedicate up to 20 hours per week to supporting a CURE. Large first and second-year CURE courses are prioritized for research coach support. Currently, the CDCI provides administrative and financial support for hiring a research coach.

In addition, the CDCI and the OEL staff develop resources to support students and faculty engaging with CUREs. For example, in partnership with Libraries and Cultural Resources, and building on the experience of a former research coach, a [LibGuide](#) was created for UCalgary students conducting undergraduate research. Students are expected to reflect on their learning as a component of high-quality course-based research experiences. To support course instructors or research coaches in developing meaningful opportunities for students to reflect, we created a stand-alone, online [learning module for critical reflection](#) as part of the Taylor Institute resource library.

Program Outcomes

We articulate CURE program outcomes across three participant groups: students, course instructors, and research coaches (Table 2).

TABLE 2 CURE PROGRAM OUTCOMES FOR STUDENTS, COURSE INSTRUCTORS, AND RESEARCH COACHES

PARTICIPANTS	OUTCOME
Students	Determine a research trajectory by developing a research plan, identifying a specific area of inquiry, assessing the viability and suitability of research practices, carrying out the research plan and communicating research findings
	Collaborate with other researchers to apply disciplinary approaches in designing, planning, and implementing a research project
	Describe the importance of research to communities on- and off-campus; effectively communicate the value and impact of research and conclusions to various audiences
	Reflect on and articulate the impact of the research experience on research skill development and researcher identity
Course Instructors	Design and integrate course activities to focus student learning on knowledge production
	Facilitate students moving through the challenges and opportunities of term-based research
	Participate in a collaborative practice of teaching with innovative, evidence-based pedagogies
Research Coaches	Generate contributions to the scholarship of teaching and learning / educational research
	Develop professional and academic skills in facilitating learning and mentoring research
	Collaborate on the delivery of innovative, research-focused pedagogy
	Advance a scholarly and practical understanding of teaching and learning approaches/techniques

CURE Courses

Since Fall 2020, eight courses across five faculties have conducted a CURE in second, third, and fourth-year undergraduate courses (Table 3).

TABLE 3 2020-21 CURE COURSES, COURSE INSTRUCTORS, AND ENROLLMENT

YEAR	FACULTY	COURSE	COURSE INSTRUCTOR(S)	ENROLLMENT
2020	Kinesiology	KNES 331: Foundations of Coaching	Dr. Cari Din	40
	Science	ZOOL 435: Entomology	Dr. Mindi Summers	80
2021	Science	BIOL 313: Principles of Ecology	Dr. Ariane Cantin	386
	Arts	COMS 591: Senior Seminar in Communication and Media	Dr. Victoria Guglietti	29
	Schulich	ENGG 319: Probability, Statistics and Machine Learning	Drs. Kazi Sumon, Md Kibria, Josephine Hill, Sameh Nassar & Ali Shayete Zeraati	564
	Arts	INDG 502.4: Advanced Topics in Canadian Indigenous Studies	Dr. Adela Kincaid	14
	Kinesiology	KNES 375: Tests and Measurement	Dr. John Holash	77
	Science	ZOOL 567: Animal Behaviour	Dr. Mindi Summers	94

Impact

1,280+

Students across 8 courses

11

Course instructors from 5 faculties

11

Research coaches

9

Community partners

Student Outcomes

At the end of each semester, we seek to assess what students have gained from their CURE experience concerning the stated learning outcomes. Students can opt to complete an exit survey comprised of likert-type and open-ended short-answer questions.

Across all eight CUREs since 2020, survey respondents were prompted to identify research activities they completed as part of their CURE experience. Throughout, three activities were reported as “strongly agree”: “I collected and contributed to data during the research experience”, “I analyzed and interpreted data in the research experience”, and “I communicated my research experience” (Table 4).

TABLE 4 IN THE RESEARCH EXPERIENCE, I... (N=154)

Question	Strongly disagree (%)	Somewhat disagree (%)	Neither agree nor disagree (%)	Somewhat agree (%)	Strongly agree (%)
I contributed to crafting a question for the research experience	3.0	5.2	5.2	33.3	53.3
I collected and contributed to data during the research experience	3.0	1.5	3.0	20.7	71.9

I analyzed and interpreted data in the research experience	1.5	3.0	0.7	23.0	71.9
I communicated my research experience	3.0	3.0	4.5	18.7	70.9
I increased my understanding of research, what it is and how it works	2.3	2.3	7.8	34.4	53.1

In addition, survey respondents are prompted to select from a list of knowledge, skills, and abilities they developed due to their CURE experience. Participants could select all that applied to them. Across all eight CUREs, the top three most reported developments were:

- “My ability to communicate research-based information” (58.4%)
- “My ability to collaborate/build relationships/work with others” (57.8%)
- “My ability to navigate ambiguity” (54.5%)

In the short-answer section of the survey, respondents reported diverse learning from their CURE experience. Much of this learning was discipline-specific, yet two broad themes emerged. First, many students gained a new understanding or appreciation for the research process broadly or for a specific step or skill within research, such as conducting literature reviews or coding. In the words of one student:

“[This research experience helped to develop] an appreciation for how much time is required to review the literature, create a research question and protocol. More specifically, however, because the topic chosen by our lab section was not widely studied, the creation of a protocol for the CURE lab definitely helped us to develop creativity!”– CURE Student

Second, other students reported learning about themselves, particularly their research or career interests. As we saw in PURE, this learning generated new or affirmed existing interests. However, unique to CUREs, more students described new perspectives of whether they were interested in research *at all*. Of these, many respondents reported previously avoiding research. As one student stated:

“Before, I was not a fan of research because it was super intimidating, but this course has changed my view.”
- CURE student

Another student commented on how they had been interested in research but gained experience and clarification in meaningful ways:

“I did not think that research is something that I was interested in throughout my undergrad, but after this experience, that has changed. This experience has allowed me to synthesize and understand different research perspectives and shape my own opinion on what research fields I am interested in. It has also given me a new appreciation for scholarly articles and research papers” – CURE Student

Course Instructor Outcomes

At the end of the semester, course instructors are invited to participate in a debriefing session. The session allows staff to capture the experiences of multiple instructors with their individual CURE designs and class contexts in mind. We continually adapt the inputs and resources to help instructors prepare and deliver a high-quality course-based research experience from this information.

Throughout our conversations in 2020-21, course instructors commented on how CUREs impact student learning and engagement and the value of research coaches as an instructional resource. CUREs serve as an impetus for *students as partners*. In the words of one instructor:

“I appreciate CUREs because they enable student agency, curiosity, and authentic assessment. Students take responsibility for their learning. They discover, synthesize, and integrate the best research available into practical resources. They have an opportunity to be bold and creative” – CURE course instructor

We also heard that the structure of the CURE preparatory sessions and the collaboration with educational consultants as mentors and research coaches as aides fosters faculty professional development. Moving through the CURE sessions as a cohort strengthens instructors’ learning from one another across diverse disciplines. One CURE instructor shared:

“During this time, especially with being online, this experience stretched Zoom as far as it can go in the classroom. The knowledge co-creation piece [with students and my research coach] was huge for me. I am still learning, and I am going to pursue it further as a result of this CURE specifically” – CURE course instructor

As a result of their CURE experience, instructors reported new perspectives about who can do research and engage undergraduates in research for the first time. As expressed in conversation with two CURE instructors:

CURE Instructor 1: “I see research becoming less elitist. I hope that I can pass that on to my students that ‘you are doing research right now.’ I heard from another student that these types of courses make research real. They originally thought it was this big lab searching for the cure for cancer, but they realize now that they can do research, too. I hope that with these experiences, they have an example of how to advance to next steps in research.”

CURE Instructor 2: “Yes, I agree, and I am so glad that these types of experiences can help students open their minds about what they can do. I just heard that one CURE student applied for graduate school. We are also starting to make connections with more community partners and undergraduates have (or can learn) lots of interests, skills, or expertise that they are looking for.”

Laurel Sherriff. Community-Engaged Learning Specialist, ZOOL 567: Animal Behaviour

“When Dr. Mindi Summers and I first connected, she was looking to grow ZOOL 567 into a community-engaged learning course. My role was to collaborate with her in balancing community and university needs, while also being authentic to her vision for the course. In Fall 2021, Dr. Summers and I partnered ZOOL 567 with the Calgary Humane Society, the Alberta Farm Animal Care Association, and the Alberta Institute for Wildlife Conservation. Students researched a topic of interest to their community partner, like ‘what kinds of enrichment activities minimize stereotypical behaviours in rescued animals?’ Dr. Summer’s and students’ engagement with their community partners was astounding. They had so much energy and passion! Some students even asked if they could take their research projects to their own community partners, as they wanted to continue their research outreach to broader communities.”



FIGURE 10 IMAGE OF RESCUED DOG. COLOURBOX

Research Coach Outcomes

Across three academic terms, a series of group check-ins have given us a sense of the experience students have while working in the research coach role. These check-ins have included mid-term and end-of-term surveys and focus groups. The research coaches reflect on and share their perspectives and the benefits and challenges of supporting instructors and students in CUREs.

In our end-of-term focus groups, research coaches reported considerable gains in skill development (exercising boundaries, coaching, giving feedback) and pedagogical innovation (facilitating group projects, preparing learning materials, developing rubrics).

“[My biggest gains came from] being able to work with the lab coordinator... We helped her with the activity design each week. [Being] involved in helping create and troubleshoot the materials and offer suggestions before involving students was really helpful for me” – CURE Research Coach

These reflections echoed the comments we heard about research coaches from instructors and students, many of whom saw their research coach as essential to their CURE’s instructional and student success.

“The [research coaches] and I presented at two conferences last spring/summer. We also published an article last summer and have recently submitted another” – CURE Instructor

We also heard a unique characteristic of CURE research coach outcomes. Most reflected on their CURE experiences from two perspectives simultaneously: as an advanced learner and developing researcher in their field and as a newcomer to teaching and learning. This stage of professional development elicits strength and growth as empathetic mentors and adaptable scholars.

“One of the most valuable things that came with our course was that we had a very broad spectrum of students, like different age ranges and backgrounds, and it showed that different approaches are valuable for different people and just to kind of figure out the best way for each student instead of a blanket approach” – CURE Research Coach

Marcus B. Young. Research Coach, COMS 591: Senior Seminar in Communication and Media

“I am in the first year of my MA, and my research specializes in aesthetics, visual culture, and queer photography. Dr. Maria Victoria Guglietti was my honour’s supervisor, and when she pitched the COMS 591 Research Coach role, I was struck by how hands-on it was. At first, I assumed it was like a TA-ship, but once I started, that was not the case. I got to see how what I was teaching was also applicable to what I was doing in my own studies. Students would tell me stories or show me their work that made connections in ways that were exceptionally unique. Often, one makes assumptions based on years of experience, but those assumptions aren’t necessarily obvious to students doing research for the first time. This prompted me to be more flexible, which surprised me. I learned to be more reflexive about research and research mentorship, and I am more in tune with the tensions between objectivity and subjectivity in my own work.”



**FIGURE 11 MARCUS B. YOUNG.
PHOTO PROVIDED BY M.B. YOUNG**

Program Storytelling and Recognition

In 2020 and 2021, CUREs were featured and celebrated in two UToday stories:

- “Undergrads conduct reconciliatory research with Indigenous communities” ([link](#))
- “Bug-eyed for research: Undergrads catalogue Calgary’s insects” ([link](#))

Of note, several CURE instructors have recently been recognized with awards:

- [Experiential Learning Project in Sustainability Award](#), Zoology 435 – Entomology Team | conferred by the Office of Sustainability
- [Teaching Excellence Award](#) – Dr. Mindi Summers, Faculty of Science | conferred by the Students’ Union
- [Hall of Fame](#) – Dr. Cari Din, Faculty of Kinesiology | conferred by the Students’ Union
- [Award for Curriculum Development](#) - Faculty of Kinesiology Curriculum Review Team including Dr. Cari Din | conferred by the University of Calgary
- [Award for Experiential Learning](#) - Dr. Mindi Summers, Department of Biological Sciences, Faculty of Science | conferred by the University of Calgary

Community Partners

Students in ZOOL 435, INDG 502, & ZOOL 567 engaged with the following organizations and initiatives (Table 5)

TABLE 5 CURE 2020-21 COMMUNITY PARTNERS

Organization	Project
Alberta Farm Animal Care Association	Animal Behaviour Topic Reviews
Alberta Institute for Wildlife Conservation	Animal Behaviour Topic Reviews
Calgary Humane Society	Animal Behaviour Topic Reviews
City of Calgary	Cataloguing biodiversity
Eco Trust	Indigenous communities
Fridays for Future	Ecology stewardship & climate activism
iNaturalist	Crowd-sourced global repository and entomology community
University of Calgary	Biogeoscience Institute, <i>Kananaskis Field Station</i> – community garden
	Canadian Institutes of Health Research (CIHR) grant - <i>Exploring Indigenous Maternal Child Health: Planning and Disseminating the Indigenous Maternity Experiences Survey</i> , Dr. Jennifer Leason (PI) & Elder Evelyn Goodstriker
	The Indigenous Circle
	Office of Sustainability
	Taylor Institute for Teaching and Learning - <i>paralleling Indigenous ways of knowing and being</i>
University of Saskatchewan	Indigenous Students Achievement Programs (ISAP)

RESEARCH ON GLOBAL CHALLENGES (UNIV)

Research on Global Challenges is a CURE offered by the CDCI and taught by the CDCI Academic Lead, Dr. Kyla Flanagan. In this course, students learn about the research process by conducting a research project under the mentorship of an experienced faculty member. Projects are based on course research streams that align with one or more of the [United Nation’s Sustainable Development Goals](#). Students explore responses and solutions to global challenges in a relevant global context. In this unique course, students develop fundamental research, teamwork, problem-solving, and collaboration skills. See Appendix C for the Course Syllabus.

UNIV had two course offerings, UNIV 401 in winter 2021 and UNIV 302 in fall 2021. Students need to have completed first year to apply for the course. Three out of the four supervisors in UNIV 401 continued in UNIV 302.

UNIV 401 | 4 research streams | 42 students



Pandemics
Dr. Christian Jacob – 16 students



Carbon Dioxide Removal
Dr. Benjamin Tutolo – 6 students



Indigenous experiences with police
Dr. Adam Murry – 12 students



Humans, animals and the environment
Dr. Adela Kincaid – 8 students

UNIV 302 | 5 research streams | 52 students



Digital Worlds
Dr. Christian Jacob – 10 students



Conserving freshwater ecosystems
Dr. Christie Sampson – 12 students



Indigenous experiences with police
Dr. Adam Murry – 13 students



Humans, animals and the environment
Dr. Adela Kincaid – 6 students



Toward a more accessible Canada
Dr. Victoria Fast – 11 students

Students are accepted into UNIV courses on an ongoing basis until the course is full or at the application deadline. For both UNIV 401 and UNIV 302, we received more applicants than spots in the courses early in the application process. Consequentially, applications were closed before the deadline (Table 6).

TABLE 6 UNIV 401 AND UNIV 302 ACCEPTANCE RATE

COURSE	# APPLICANTS	# ACCEPTED STUDENTS	% ACCEPTANCE RATE
UNIV 401	62	45	73%
UNIV 302	82	52	63%
Total	144	77	68%

Course Outcomes

Learning outcomes in UNIV courses are bundled around four course components: Research Foundations, Community & Collaboration, Reflection & Skills Articulation, and Research Dissemination (Table 7).

TABLE 7 GLOBAL CHALLENGES (UNIV) COURSE OUTCOMES

COMPONENT	LEARNING OUTCOME By the end of the course, students will be able to:
Research Foundations	<ul style="list-style-type: none"> Develop a research plan, identify a specific area of inquiry, assess the viability and suitability of research practices, carry out the research plan Demonstrate an awareness of and adherence to the safety and ethical research practices of the discipline Demonstrate an understanding of the research process, diverse research methodologies, and the interpretation and critical analysis of data & information Search the literature to find needed information, evaluate the credibility of sources and information, organize information to reveal patterns and themes, and analyze information critically to produce a coherent understanding
Community & Collaboration	<ul style="list-style-type: none"> Collaborate with researchers in the design, planning, implementation, and dissemination of a research project Demonstrate the five key competencies identified as critical to team effectiveness (commitment, communication, knowledge, uphold high standards & focus) during work with team members
Reflection & Skills Articulation	<ul style="list-style-type: none"> Reflect on and articulate the impact of UNIV 302 on your personal learning goals, research skill development, and your identity as a researcher
Research Dissemination	<ul style="list-style-type: none"> Describe the importance of your research to communities on- and off-campus Effectively communicate the value and impact of your research and conclusions to a variety of audiences

Impact

Research on Global Challenges allows students to explore interdisciplinary and multidisciplinary solutions to global challenges. To evaluate the impact of the UNIV course on student learning, we conduct unique evaluation research activities to understand the student, supervisor, and research coach experience. The purposes of these activities are to assess the outcomes, strengths, challenges, and impact of UNIV courses for all stakeholders, including students, supervisors, research coaches, and the UNIV Team. These insights directly inform continuous learning about and improvements for the UNIV courses. We can also identify recommendations for sustainably expanding these opportunities across campus by reflecting on this evidence.

Student Outcomes

We collect feedback at the start and end of the term to evaluate student outcomes through entry and exit surveys. These surveys aim to learn what students gain from their UNIV experience concerning the course learning outcomes. Students get a small participation grade for completing the survey. In synthesizing two years of evaluation findings, three characteristics stand out about students at the start of the term:

- Most students are in their 3rd year (UNIV 401: 45%; UNIV 302: 35%),
- Most students report no prior research experience (UNIV 401: 66%; UNIV 302: 65%),
- The primary motivations for students to apply for the course are to develop their research skills and to work in an interdisciplinary team.

In the student entry survey, we ask respondents to estimate their current research skills in several areas at the start of their UNIV experience. Most UNIV 302 students estimated their skill levels between "a moderate amount" and "a great deal" (Figure 12). These estimates are consistent with UNIV 401 survey findings.

FIGURE 12 UNIV 302 ENTRY SURVEY: FOR EACH ELEMENT, GIVE AN ESTIMATE OF YOUR CURRENT LEVEL OF RESEARCH SKILLS (N=49)

Question	None (%)	A Little (%)	A Moderate Amount (%)	A Great Deal (%)	Extensive (%)
Ability to read and understand the primary literature	0.0	2.0	24.5	51.0	22.5
Ability to work independently	0.0	0.0	16.3	32.7	51.0
Ability to analyze data and other information	0.0	4.1	36.7	53.1	6.1
Ability to integrate theory and practice	0.0	8.2	30.6	51.0	10.2
Skill in the interpretation of results	0.0	4.1	40.8	49.0	6.1
Understanding of research	0.0	8.2	34.7	42.9	14.3
Understanding of ethical conduct in your field	0.0	18.4	24.5	32.7	24.5
Understanding of techniques and research methods in your field	0.0	18.4	36.7	40.8	4.1
Understanding how researchers work on real problems	0.0	24.5	30.6	40.8	4.1

FIGURE 13 UNIV 302 EXIT SURVEY: IN TERMS OF RESEARCH SKILLS, GIVE AN ESTIMATE OF THE EXTENT TO WHICH UNIV IMPROVED YOUR ABILITY IN THE FOLLOWING AREAS (N=47)

Question	None (%)	A Little (%)	A Moderate Amount (%)	A Great Deal (%)	Extensive (%)
Ability to read and understand the primary literature	0.0	6.5	10.9	37.0	45.7
Ability to work independently	2.2	19.6	15.2	37.0	26.1
Ability to analyze data and other information	0.0	10.6	10.6	48.9	29.8
Ability to integrate theory and practice	0.0	4.3	6.4	57.5	31.9
Skill in the interpretation of results	0.0	6.4	4.3	59.6	29.8
Understanding of the research process	0.0	0.0	8.7	37.0	54.4
Understanding of ethical conduct in your field	0.0	6.4	14.9	46.8	31.9
Understanding of techniques and research methods in your field	0.0	8.5	14.9	36.2	40.4
Understanding of how researchers work on real problems	0.0	0.0	2.1	44.7	53.2

In the exit survey, we ask respondents to estimate the extent to which their UNIV experience improved their research skills. Students reported the greatest gains in their “understanding of how researchers work on real problems” and “understanding of the research process” (Figure 13). This is consistent with Winter 2021 survey findings.

Compared to PURE and CUREs, students in UNIV uniquely report developing *interdisciplinary* research skills. Throughout their exit survey responses, many students reflected that working in an interdisciplinary team required significant growth in their communication and collaboration skills. For some, this meant learning how to translate their own disciplinary experience into a language their peers could understand. As one student shared:

“One research skill I have gained from UNIV 302 is the ability to collaborate with peers, especially those who have distinct academic backgrounds than myself. I think this was a very eye-opening experience, although challenging at first when we had to formulate a research question. Yet, this challenge made me more aware and appreciative of other academic disciplines, and I am now interested to work more closely in cross-functional teams.” – UNIV 302 Student

For others, working in an interdisciplinary team created a new appreciation for disciplinary diversity. Students recognized that even if their peers came from similar backgrounds, there was no guarantee they would take similar approaches. We heard this observation from stream supervisors as well when one stated, “Just because they’re science students doesn’t mean they’re all the same.” For students to engage in creative and efficient problem solving, they had to learn how to identify and articulate both their own strengths and interests and those of their peers. As one student reflected:

“For myself, [the research skill I gained/amplified during UNIV 302] is the ability to work in a team of individuals who have similar interests, but varying backgrounds. The interdisciplinary experience is one that will be hard to replicate in other courses and it also showed me that even people who seem to have the same backgrounds can bring a completely different skillset to a project. I was able to understand and boost my own strengths and play off the strengths of the rest of team members at the same time. Being able to do this is something that I’ll attempt to apply in other classes moving forward.” – UNIV 302 Student

Mackenzie Van Doorn. UNIV 401, “Humans, Animals and the Environment”

“I am a third-year Cellular, Molecular and Microbial Biology student. UNIV 401 diversified my educational experience. I collaborated with students in different disciplines in ways I had never done before. Also, learning about research and Indigenous peoples and their lived experiences opened new ways of knowing for me. In my research stream, I learned how to conduct literature reviews and synthesize the findings in a way that was easy to understand and relevant to our research question. We collected articles from broad areas, like animal-human relationships, and mental health. Dr. Flanagan and Dr. Kincaid helped us to visualize our literature findings with citation management software, which showed us how these seemingly very different elements could apply to the same research question. Now that I’ve learned to appreciate such an interdisciplinary approach, I’m keen to do research in my field. In 2022, I am going to apply for a PURE Award and opportunities to work in a research lab.”

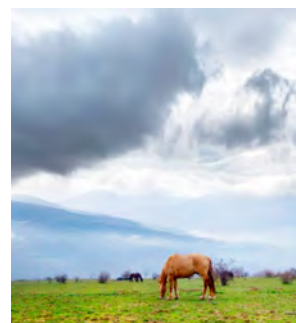


FIGURE 14 IMAGE OF HORSE IN A FIELD. COLOURBOX.

Supervisor Outcomes

UNIV Stream Supervisors provide UNIV students mentorship for designing a research project, applying research methodology, and preparing findings to share with others. We engage in continuous conversation on their UNIV

experience to evaluate supervisor outcomes. Specifically, we conduct monthly informal check-ins to discuss how the course is going, their thoughts or questions about their research stream, and their supervisor experience. At the end of the semester, stream supervisors are invited to a group discussion on their UNIV experience and its impact on their teaching, research, and mentorship practices.

All supervisors observed that UNIV had a positive impact in getting students to take a more exploratory approach to research. As one supervisor shared:

“[I agree that there’s something about getting the students to think] more about having fun and that there’s exploration in research. You’re not sure where you are going at the beginning, and that’s totally fine. What [Dr. Flanagan] did in the classroom helped a lot to really guide students along and say, ‘okay, so, is there a process in place’ and it was, I think, nicely structured. Then, we could connect that to what their research projects would be about and say, ‘okay, well, you don’t have to figure out everything within the first week - not even within the first month, so really take the time to reflect on your learning and reflect what research is, and look at all the different ways you can perform research because there are also different ways to get information.” – UNIV 401 Supervisor

When asked about how their UNIV experience impacted their undergraduate research mentorship practices, supervisors expressed gratitude and appreciation for the multiple disciplines represented in their streams. In the future, supervisors would like to push interdisciplinary collaborations *even more*. As one UNIV 401 supervisor shared, “That’s really what attracted me to this course, because I thought this would be a great vehicle to really bring different disciplines together and, almost like an experiment, to see: how far away can disciplines be and still get things done together and work together towards a common goal?”. This was echoed in the UNIV 302 end-of-term discussion, with additional insights into the unique challenges of an interdisciplinary course. As one supervisor shared, “[Our stream’s success] speaks to how strong the students were coming in. They really hit the ground running with all of the things I’d been researching and wanting to do... [yet] I had to pull them back a lot [and] temper expectations [and] emphasize that the class was more about them all working together”.

Across stream supervisors in both courses, mentoring students in such an interdisciplinary context required prompting students to think differently about their unique combinations of disciplinary approaches and personal strengths. Strategies to promote interdisciplinary collaboration included peer feedback, guest speakers, and “borrowing” from different disciplines.

Research Coaches Outcomes

Two research coaches opted to participate in an end-of-term group interview to debrief on their UNIV 401 experiences, particularly how UNIV 401 influenced their perception of interdisciplinary research, their understanding of teaching and learning approaches, and their teaching, learning, and mentoring skills. Throughout the conversation, both Research Coaches reflected on how much of their UNIV experience affirmed their knowledge, skills, and abilities while also challenging them to try new strategies. Both left their research coach experience with language and resources they previously did not have (or know existed) to describe their research experiences and coach others through it.

These reflections align with feedback on the impact of Research Coaches on student learning from students and supervisors. UNIV students and supervisors repeatedly report that the research coaches were essential to the success of the course. As one student shared: “I think the [Research Coach] was the most instrumental to my learning this semester. She was always readily available and provided us with many resources and additional examples to help us guide our research”.

Owen Brierley. Research Coach, UNIV 401: Research in Global Challenges, “Pandemics”

“I am a PhD Candidate in the Computational Media Design Program with a focus on game design research. Being a Research Coach in UNIV 401 was an opportunity to support undergraduate research while also applying my doctoral research on simulating real-world environments affected by the COVID-19 pandemic. The ‘Pandemics’ stream modeled shopping in a grocery store during a pandemic. With my background as an actor, I look at games from the perspectives of storytelling and believability. The more accurate the simulation is, the more we can understand the motivation behind events occurring in these spaces. I spent much of my time coaching students about transitioning from “memorizing the right answer” to independently finding the answer that the evidence shows. We had to build a lot of trust to navigate the uncertainty that comes with research. My teaching philosophy evolved in profound ways. I got to see the scholarship that supported insights from my previous teaching experiences. It was validating and empowering to see that there’s a community of scholarly conversations that I can reference and develop further.”



**FIGURE 15 OWEN BRIERLEY,
PHOTO PROVIDED BY O.
BRIERLEY**

Program Storytelling and Recognition

Research on Global Challenges was featured in a recent UToday article: “Undergrads conduct reconciliatory research with Indigenous communities: Course-based experiential learning in College of Discovery, Creativity and Innovation promotes collaboration” ([link](#)).

The CDCI Academic Lead, Dr. Kyla Flanagan, and Stream Supervisor, Dr. Adam Murry, received prestigious teaching awards associated with their UNIV work.

- Dr. Kyla Flanagan's teaching excellence was honoured with McCaig-Killam Teaching Award” ([link](#)).
- Dr. Adam Murry’s mentorship excellence for undergraduate research in the Department of Psychology, Department of Political Science, and UNIV “Indigenous Experiences with the Police” research stream was honoured with a Killam Undergraduate Mentorship Award ([link](#)).

EQUITY, DIVERSITY, AND INCLUSION (EDI) AND INDIGENOUS ENGAGEMENT

Underrepresented identifying students experience barriers to persistence in research opportunities in higher education. In 2021, we created an **EDI Action Plan** to address the accessibility of undergraduate research. We hired a research assistant to identify, evaluate, and recommend modifications aligned with the University of Calgary's [ii' taa'poh'to'p, Indigenous Strategy](#) and the Office of Equity, Diversity, and Inclusion's mission. In consultation with cross-campus EDI experts and review of existing EDI and Indigenous initiatives, including the [Equity, Diversity and Inclusion in the Research and Teaching Awards](#), we have established foundational knowledge on how underrepresented identifying students experience barriers to research opportunities and how we can action strategies that increase access and equity in our programs.

We first focused on PURE to ground our work in an established URI program and developed a baseline understanding of demographics in the PURE student population. See Appendix D for an infographic summarizing our PURE EDI demographic findings. We analyzed student applications for demographic representation, explored best practices for collecting demographic data, reviewed institutional and national EDI action plans, created undergraduate research workshops with an EDI lens, consulted with experts on reducing barriers to research for undergraduates, and surveyed the literature. We also created new EDI-focused questions in the PURE student exit survey. The purpose of these questions was to understand barriers to access and inclusion and the desired supports to minimize them. Key findings of this work include:

- Students are hesitant to answer self-identifying questions, particularly those related to Indigenous, disability, and visible minority self-identification. Given this finding, we have modified our survey tools to include an explicit statement on the intent, purpose, and objectives for asking demographic questions.
- In PURE, men and Indigenous students are underrepresented in the applicant population relative to the general UCalgary student population.
- The adjudication process for PURE appears to be unbiased as there are minimal shifts in demographics between PURE eligible students and those offered an award.
- Consultation findings provided actionable direction for modifying the student information sessions, award Terms of Reference, website, and PURE award requirements.
- The top three most-reported barriers to access were decreased access to research spaces because of COVID-19, giving wage-earning work to participate in PURE, and balancing technological and transportation expenses required to conduct their PURE project
- The top three most-reported barriers to inclusion were concerns that they were not qualified to do research, that they did not see students like themselves in PURE, and that their knowledge, skills, and ways of knowing would not be recognized
- The top three desired modifications to the PURE Terms of Reference were to increase the PURE award amount, allow students to apply for PURE in groups, and create a part-time PURE award.

The EDI Action Plan concluded with 22 recommendations for improving the accessibility of PURE (Appendix E). These recommendations are aligned with EDI in the [Research and Teaching Awards Pilot Plan](#) and the practices summarized therein to "ensure nominators, nominees, and selection committee sees and recognizes excellence in diverse forms."

We seek to recognize and facilitate research that engages Indigenous researchers and impacts Indigenous communities. Drs. Adam Murry and Adela Kincaid, an assistant professor in Psychology and an instructor in the International Indigenous Studies program, led research projects in all three URI programs that addressed topics such as Indigenous relationships with police and human-animal relationships through an Indigenous way of knowing lens. These student-led research projects leave a profound impact on both the students and the communities, allowing for a cross-collaborative approach that furthers insights and learnings.

This work is only the start. Continued collaboration with the Office of Equity, Diversity, and Inclusion, the Office of Indigenous Engagement, student groups, and the Dimensions Pilot Program will be vital to acting on these recommendations and effecting change in undergraduate research at UCalgary.

SUMMARY AND WHAT'S NEXT

Over the past **two years**, the CDCI's Undergraduate Research Initiative has supported **over 1600 students conducting research** at UCalgary. For all students, we have focused on building high-quality undergraduate student research experiences that intentionally evoke students' *curiosity*, engage students in the process of *discovery*, ensure there is an opportunity for students to *disseminate findings*, and extend student learning through *critical reflection*.

The URI has centered on three signature programs: the Program for Undergraduate Research Experience (PURE), Course-based Research Experiences (CUREs) and Research on Global Challenges. We have innovated new solutions and approaches, seeking ways to expand capacity while increasing access for students across all disciplines, experiences, and backgrounds.

What's next for the CDCI's URI?

We aim to expand our support of high-quality undergraduate research and experiential learning opportunities at UCalgary, making research more accessible for students and building relationships with units across campus.

- Expand the *Research Skills Foundations* badge beyond PURE to be accessible for students across campus. We will offer a series of Research Skills workshops during the Fall and Winter terms that students can participate and reflect on to earn the badge.
- Continue to integrate EDI and Indigenous Engagement practices and principles in the context of undergraduate research.
- Explore ways to use Elevate and the Experiential Learning catalogue to increase visibility and access for students to undergraduate research opportunities.

Program for Undergraduate Research Experience (PURE)

- Use program evaluation data to advance PURE workshops to improve support for students and supervisors.
- Transition the application process for summer studentships, including PURE, to a new application portal for 2023.
- Add program enhancements like offering student writing clubs, integrating with the FUSION Skill Development Program, and providing optional resources for PURE supervisors.
- Work with Faculties and the Office of Advancement to seek additional funds for PURE.
- Implement EDI recommendations from the PURE EDI report.

Course-based Undergraduate Research Experiences (CURE)

- Expand the number and types of CUREs.
- Develop a CUREs badge program for instructors interested in the pedagogical design of research experiences.
- Seek additional funding for research coaches.
- Support a community of practice for instructors conducting CUREs.
- Continue to develop resources and materials to develop expertise and capacity for CUREs across disciplines

Research on Global Challenges

- Disseminate the Research on Global Challenges course model and impact.
- Work with the Associate Deans, Teaching and Learning in the Faculties of Arts and Science to develop a plan for the next steps for Research on Global Challenges.

The impact of students conducting research on their learning is profound. Our goal is to expand capacity and reduce barriers for students to conduct research. Over the last two years, we have provided an exceptional level of support for instructors and students engaging in research. To bring this work to the next level, we want to increase the visibility of the work of the CDCI and develop partnerships with others dedicated to undergraduate research.

Appendix A: PURE Program Outcomes

BUNDLE	LEARNING OUTCOME	CORE SKILLS
Research Skills	<ul style="list-style-type: none"> • <i>Develop</i> a research plan, <i>identify</i> a specific area of inquiry, <i>assess</i> the viability and suitability of research practices, <i>carry-out</i> the research plan and <i>communicate</i> research findings. • <i>Formulate</i> a research question, study aims, and hypotheses • <i>Identify</i> the knowledge required to meet research aims anticipating ethical, cultural, and social considerations. • <i>Identify & generate</i> information/data required using appropriate methodology. • <i>Evaluate</i> the credibility of sources, information & data and can make your research processes visible. • <i>Organize</i> information & data to reveal patterns/themes, managing teams & processes. • <i>Analyze</i> information/data critically & synthesize new knowledge to produce a coherent understanding. • <i>Collaborate</i> with other researchers in the design, planning, and implementation of a research project. • <i>Describe</i> the importance of your Research to communities on- and off-campus; effectively <i>communicate</i> the value and impact of your Research and conclusions to a variety of audiences. 	<ul style="list-style-type: none"> • Problem-solving • Communication • Organizational skills • Learning independently • Applying research skills and tools • Judgement • Organization • Creativity
Research Identity	<i>Reflect</i> on and <i>articulate</i> the impact of the PURE research experience on research skill development and researcher identity.	<ul style="list-style-type: none"> • Reflective practice • Organizational Skills • Learning independently • Judgement
Career Goals	<i>Reflect</i> on and <i>articulate</i> the impact of the PURE research experience on academic and professional growth and career goals.	<ul style="list-style-type: none"> • Reflective practice • Learning independently • Communication • Judgement
Community Building	<i>Establish</i> and <i>participate</i> in a community of scholars, <i>developing</i> a network of undergraduate, graduate, and faculty researchers across campus and beyond.	<ul style="list-style-type: none"> • Reflective practice • Collaboration • Communication

Appendix B: PURE 2021 Workshops & Events

Title: **PURE Orientation**

Date: April 30, 2021

Time: 1:00-2:30

Description: 2021 PURE Award recipients are invited to the PURE Orientation to kick off your PURE research term. Learn more about the 2021 PURE Awards programming, connect with peers, and begin your research.

Learning Outcomes:

- Introduce you to the PURE team and the 2021 PURE cohort
 - Review outcomes, expectations, and program timeline
 - Highlight workshops, D2L resources, and a micro-credential opportunity for you as a PURE undergraduate researcher this spring/summer
 - Examine the research process & get started on your research planning
-

Title: **PURE Supervisor Orientation**

Date: May 6, 2021

Time: 12:00-1:00

Description: In an effort to learn how the PURE Awards team can best support you throughout this remote research term and to foster community amongst supervisors, we invite you to join us for a PURE Supervisor Check-in on Thursday, May 6th at 12:00 pm - 1:00 pm. This will be an informal check-in where you will have the opportunity to connect with other PURE supervisors, discuss best practices for remote supervision, and identify current or potential challenges you think the PURE Awards team could help address over the research term.

Title: **Research skills: Finding scholarly information**

Date: May 13, 2021

Time: 12:00-1:30

Description: This session will introduce students to a process for locating research on a topic. It will begin by introducing question frameworks, which is one way of identifying the important concepts in their research question. Students will then look at how to create a search strategy for an individual concept incorporating synonyms and operators. Finally, the session will demonstrate how to execute a search in a multi-disciplinary database, apply filters and other strategies to broaden or narrow a search, and showcase some of the advanced functionality available in the database.

Learning outcomes:

- Create a focused research question using a question framework
 - Create a search string containing synonyms for a given concept
 - Utilize operators such as truncation, forced phrase searching, and Boolean operators
 - Identify strategies to broaden or narrow their search
 - Identify highly cited papers on a specific topic
-

Title: **The basics of project and data management planning for research projects**

Date: May 20, 2021

Time: 12:00-1:00

Description: If you're new to planning or collaborating on an academic research project, a project management approach can help make things go smoothly. This session will introduce principles, methods, tools and techniques to help with project planning in an academic context. A key aspect of planning a research project is data management. This session will also cover the basics of data management planning.

Learning Outcomes:

- Describe what a project is, and list the triple constraint in project management
 - Create a work structure breakdown for a simple project
 - Identify tools (Gantt charts, etc.) that can be used to aid with project planning and management
-

Title: **Community Building Panel**

Date: June 10, 2021

Time: 12:00-1:00

Description: What is the importance of community? Why develop a research community? In this co-facilitated event with the Hunter Hub for Entrepreneurial Thinking, PURE students will hear from a panel of experienced researchers and explore the connections between research identity, relationship building and career development. Students will have the opportunity ask panellists questions, and learn more about the experience and journey of a career researcher.

By the end of this session participants will be able to:

- Understand the importance of developing a research community in academic contexts and beyond
 - Recognize relationship building as a practice and learn more about relationship building strategies
-

Title: **Research Skills Exploration Workshop**

Date: July 15, 2021

Time: 12:00-1:00

Description: An abstract is more than just a summary of research; it's a first impression, and it needs to be a good one. In this Skills Exploration workshop focussed on preparing for the PURE Final Assignment, students will learn the critical components of compelling written and graphical abstracts that effectively communicate the research process and findings. Students will have the opportunity to explore the research skills they have cultivated during PURE and identify skills to improve on or begin developing.

Learning Outcomes

- Clarify the expectations for the PURE Final Assignment
 - Develop the foundational knowledge to begin creating a written or graphical research abstract
 - Explore and identify skill development in collaboration with other undergraduate researchers
-

Title: **Research Skills Articulation Workshop**

Date: August 19, 2021

Time: 12-1

Description: Reflective practice is essential to identifying, understanding and communicating your personal and professional growth. In this skills articulation workshop focused on the PURE Final Assignment, students will explore how to use the DEAL framework to reflect on and articulate the impact of their PURE research experience on their skills, academic/professional growth, and career development.

Learning Outcomes

- Clarify the expectations for the PURE Final Assignment
- Learn how to use the DEAL framework to reflect on and articulate the impact of the PURE research term
- Identify and explore skills articulation in collaboration with other undergraduate researchers

Appendix C: UNIV Course Syllabus

UNIV 302

RESEARCH ON GLOBAL CHALLENGES

COURSE DESCRIPTION

D2L COURSE NAME: UNIV 302 – Research on Global Challenges

COURSE DESCRIPTION: In Research on Global Challenges, you will explore responses and solutions to global challenges by conducting supervised research within a research project stream. Develop research skills with an interdisciplinary cohort of students, investigating topics such as poverty, hunger, health, education, gender, climate change, and economic growth.

TERM: Fall 2021, Monday, September 13 – Thursday, December 9

CLASS AND TUTORIAL DAY: Mondays

CLASS TIME: 3:00 – 3:50 pm

TUTORIAL TIME: 4:00 – 4:50 pm

CLASS AND TUTORIAL LOCATION: Online via Zoom. Some in-person sessions in may be scheduled.

CREDIT HOURS: 3 units;

PRE-REQUISITES: Completed more than 30 units at the time of registration.

INSTRUCTOR NAME: Dr. Kyla Flanagan

OFFICE: TI 230

TELEPHONE: 403.220.4056

EMAIL: kmflanag@ucalgary.ca

EMAIL RESPONSE PRACTICES: I will be working hard to answer all student emails by the end of the next business day. As email is most useful for short and specific inquiries, detailed questions regarding course material and assignments should be addressed during office hours or during class time. To ensure clear and prompt communication, please include your name and UNIV 302 in your email correspondence.

OFFICE HOURS: Wednesday 3:30 – 4:30 pm or by appointment (via Zoom).

RESEARCH STREAM SUPERVISORS: Dr. Christie Sampson (Freshwater Ecosystems), Dr. Victoria Fast (Urban and digital design), Dr. Adela Kincaid (Humans, Animals, and the Environment), Dr. Adam Murry (Indigenous Experiences with Police); Dr. Christian Jacob (Digital Worlds).

RESEARCH COACHES: TBA, updated on D2L before the first week of the term.

RESOURCE LIBRARIANS: Dr. Alix Hayden will serve as an excellent resource for students for finding and evaluating evidence to inform the research process and will be attending some of our classes.

COURSE DETAILS

COURSE OVERVIEW

UNIV 302 is an experiential learning-based course where students will learn how to conduct research through a project led by a Research Supervisor. You will spend your time doing impactful research, receiving one-on-one support, and developing

research skills alongside peers. You will work closely with Research Supervisors and coaches who will provide mentorship for designing a research project, applying research methodologies, and preparing findings to share with others. Students in the course will explore responses and solutions to Global Challenges in a relevant global context. Projects are based on research streams that align with one or more of the UN Sustainable Development Goals. Given the nature of research, be prepared for some bumps along the way! I will do everything possible to ensure you are successful as we work our way through this research experience together.

TEACHING AND LEARNING APPROACHES

SPECIFICATIONS GRADING: While students will earn a letter grade in the course, assignments will be graded using a pass/fail scheme (i.e. there is no partial credit for assignments). The rationale for this approach to grading comes from research into adult learning: adults learn best when they have a flexible but challenging learning environment and can exercise some choice in their learning experience. In this course, we will create a positive and challenging learning environment in which we will uphold high expectations for work. There will be opportunities to revise work that does not meet expectations and to receive feedback and support from your supervisor, research coach, teammates, and me to achieve your best work. The specifications or requirements for a pass on each assignment are clearly stated in the rubrics for each assignment, and you will have examples of work that does and does not meet the specifications. This course provides you choice in your learning experience both in terms of the topics for some of the assignments as well as which assignments to complete. There are no traditional midterms or final exams; instead, there are various assignments from which you can choose how much to do to meet the requirements for the grade you plan to earn. We will talk more about specifications grading in the first two classes of the term, and you will have the chance to ask any questions or discuss any concerns then.

SYNCHRONOUS AND ASYNCHRONOUS LEARNING: Weekly classes will occur synchronously via Zoom Mondays 3:00-3:50 and tutorials 4:00-4:50 pm. Students will conduct an average of 5 hours of research asynchronously on their own time.

RECOMMENDED READINGS, TEXTBOOKS, AND LEARNING MATERIALS: We will be using Desire2Learn (D2L) in this course. If you need help accessing or using D2L, please visit the Desire2Learn resource page for students:

<http://elearn.ucalgary.ca/desire2learn/>

Recommended textbook: Bell, J. and S. Waters (2018) Doing Your Research Project - A Guide for First-Time Researchers. Seventh-edition. England, McGraw-Hill. (Available at the bookstore)

TECHNOLOGY REQUIREMENTS

Students will need access to: a computer with a supported operating system, as well as the latest security and malware updates; a webcam/camera (built-in or external); a microphone and speaker (built-in or external), or headset with microphone; current and updated web browser with current antivirus and/or firewall software enabled; stable internet connection. Please let me know if you have any concerns about your access to this technology or if your circumstances make it difficult for you to meet these requirements. Students may be required to access Google Docs, Google JamBoards, TopHat, Twitter, and/or other social media platforms as part of this course.

Students will be required to complete team and self-assessment inventories which are freely available to all University of Calgary students: [https://www.itpmetrics.com](https://www.itpmetrics.com;); www.ucalgary.ca/currentstudents/ucalgarystrong/cliftonstrengths

COURSE LEARNING OUTCOMES

In this course, learning outcomes are bundled around four course components: (1) Research Foundations, (2) Community & Collaboration, (3) Reflection & Skills Articulation, and (4) Research Dissemination. Successful students will be able to:

1. RESEARCH FOUNDATIONS

- 1.1. *Develop* a research plan, *identify* a specific area of inquiry, *assess* the viability and suitability of research practices, *carry-out* the research plan.
- 1.2. *Demonstrate* an awareness of and adherence to the safety and ethical research practices of the discipline.
- 1.3. *Demonstrate* an understanding of the research process, diverse research methodologies, and the interpretation and critical analysis of data & information.
- 1.4. *Search* the literature to find needed information, *evaluate* the credibility of sources and information, *organize* information to reveal patterns and themes, and *analyze* information critically to produce a coherent understanding.

2. COMMUNITY & COLLABORATION

- 2.1. *Collaborate* with researchers in the design, planning, implementation, and dissemination of a research project.
- 2.2. *Demonstrate* the five key competencies identified as critical to team effectiveness (commitment, communication, knowledge, uphold high standards & focus) during work with team members.

3. REFLECTION & SKILLS ARTICULATION

- 3.1. *Reflect* on and *articulate* the impact of UNIV 302 on your personal learning goals, research skill development, and your identity as a researcher.

4. RESEARCH DISSEMINATION

- 4.1. *Describe* the importance of your research to communities on- and off-campus.
- 4.2. Effectively *communicate* the value and impact of your research and conclusions to a variety of audiences.

ASSESSMENT COMPONENTS

For this course, you are not required to complete all assessments; instead, you will be able to choose which assessments and how many assessments you complete, according to the grade you are aiming to achieve (see GRADING below).

GRADING - The University policy on grading and related matters is described in sections F.1 and F.2 of the online University

Learning Bundle	Learning Outcome	Specifications & Assessments
1. Research Foundations	1.1	Complete the Research Planning Guide to outline research outcomes, activities, products, and criteria. Complete an <i>average</i> of 5 hours per week of research. This will be assessed by the Research Supervisor or Research Coach at the mid-semester point and end of term using the <i>Research Conduct</i> rubric.
	1.2	Complete all required safety and ethics training . This specification will be assessed by your Research Supervisor or Research Coach and must be completed BEFORE you start your research. This will be assessed by the Research Supervisor using <i>Ready for Research</i> sign off. Conduct research safely and ethically. This will be assessed by the Research Supervisor or Research Coach at the mid-semester point and end of term using the <i>Research Conduct</i> rubric.
	1.3	Attend, be on time, and participate in our UNIV 302 class activities and discussions with no more than 1 unexcused late/absence during the semester.
	1.4	Complete Annotated Bibliography entries including a cover sheet, marked-up articles, and article summary and reflection.
	2.1	Conduct research collaboratively with written agreements on Intellectual Property (IP), publication of work, research roles and responsibilities. This will be assessed by the Research Supervisor using <i>Ready for Research</i> sign off. Conduct yourself professionally in interactions with your Research Supervisor and Research Coach, including attending and being on time for weekly meetings (missing or arriving late to no more than one meeting in the semester without notice). This will be assessed by the Research Supervisor or Research Coach at the mid-semester point and end of term using the <i>Research Conduct</i> rubric.
2. Community & Collaboration	2.2	Complete 2 Peer Feedback surveys (mid-semester & final) online through ITP metrics. These surveys will produce a Peer Score for each individual in the team that will be used to quantify each individual's contribution to teamwork. Complete the Team Health Report generated from the mid-semester ITP metrics survey.
	3.1	Complete a mid-semester and final course Reflection using the DEAL model. These will be evaluated using the <i>Critical Reflection</i> rubric. Complete an Authentic Research Survey at the start and end of term that explores your experiences with research, perspectives on the research process, self-assessed research skills, and professional and career goals.
3. Reflection & Skills Articulation		
4. Research Dissemination*	4.1	Final Research Project Draft - on Dec 6 you will submit to D2L draft version of your Final Research Project before class. Final Research Project Peer-Review - on Dec 6, you will complete a peer-review of a classmate's work during class. Final Research Project - as defined by the <i>Final Research Project Specifications and Rubric</i> . The finalized draft of the Final Research Project is due on the last day of the semester (Dec 9 @ 11:59 pm) in the Dropbox on D2L.

*Note the *Final Research Project* may be completed individually or as a team, depending on the agreements outlined in *Ready for Research*

Calendar.

You will earn grades based on the requirements you choose to complete (note that you do not have to do all the assessments!). To earn a given letter grade, you must complete all the requirements listed for that letter grade.

- To earn a **D**, you must complete the *Research Foundations* and *Community & Collaboration* learning bundles to the extent outlined in the Assignment of Letter Grades table below
- To earn a **C**, you must complete the *Research Foundations* and *Community & Collaboration* learning bundles to the extent outlined in the Assignment of Letter Grades table below
- To earn a **B**, you must complete the *Research Foundations*, *Community & Collaboration*, *Reflection & Skills Articulation* and *Research Dissemination* learning bundles to the extent outlined in the Assignment of Letter Grades table below
- To earn an **A**, you must complete **ALL** the learning bundles to the extent outlined in the Assignment of Letter Grades table below

Assignment of Letter Grades

Specifications & Assessments	Requirements for each letter grade**			
	D	C	B	A
Complete the Research Planning Guide to outline research outcomes, activities, products, and criteria.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Complete an <i>average</i> of 5 hours per week of research. This will be assessed by the Research Supervisor or Research Coach at the mid-semester point and end of term using the <i>Research Conduct</i> rubric.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Complete all required safety and ethics training . This specification will be assessed by your Research Supervisor or Research Coach and must be completed BEFORE you start your research. This will be assessed by the Research Supervisor using <i>Ready for Research</i> sign off.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Conduct research safely and ethically. This will be assessed by the Research Supervisor or Research Coach at the mid-semester point and end of term using the <i>Research Conduct</i> rubric.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Attend, be on time, and participate in our UNIV 302 class activities and discussions with no more than 1 unexcused late/absence during the semester.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Complete Annotated Bibliography entries including a cover sheet, marked-up articles, and article summary and reflection.	1 Annotated Bibliography entries	2 Annotated Bibliography entries	3 Annotated Bibliography entries	4+ Annotated Bibliography entries
Conduct research collaboratively with written agreements on Intellectual Property (IP), publication of work, research roles and responsibilities. This will be assessed by the Research Supervisor using <i>Ready for Research</i> sign off.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Conduct yourself professionally in interactions with your Research Supervisor and Research Coach, including attending and being on time for weekly meetings (missing or arrive late to no more than one meeting in the semester without notice). This will be assessed by the Research Supervisor or Research Coach at the mid-semester point and end of term using the <i>Research Conduct</i> rubric.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Complete 2 Peer Feedback surveys (mid-semester & final) online through ITP metrics. These surveys will produce a Peer Score for each individual in the team that will be used to quantify each individual's contribution to teamwork.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Complete the Team Health Report generated from the mid-semester ITP metrics survey.	Final Peer Score of 0.6 or higher	Final Peer Score of 0.7 or higher	Final Peer Score of 0.8 or higher	Final Peer Score of 0.9 or higher
Complete a mid-semester and final course Reflection using the DEAL model. These will be evaluated using the <i>Critical Reflection</i> rubric.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Complete an Authentic Research Survey at the start and end of term that explores your experiences with research, perspectives on the research process, self-assessed research skills, and professional and career goals.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Final Research Project Draft - on Dec 6 you will submit to D2L draft version of your Final Research Project before class.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Final Research Project Peer-Review - on Dec 6 , you will complete 2 peer-reviews of a classmate's work during class.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Final Research Project - including all the intermediate steps as defined by the <i>Final Research Project Specifications and Rubric</i> . The final version of Research Project is due on the last day of the semester (Dec 9 @ 11:59 pm) in the D2L Dropbox	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Final Project earns an E or M	Final Project earns an E

For the above table,

- Check-marks indicate the specification must be completed to earn that letter grade,
- “X” indicates the specification is not required for the letter grade,
- The letters E and M refer to grading on an EMR rubric. E= Excellent, M=Meets expectations, R=Needs Revision. A grade of **R** indicates that the requirements for the assignment are **NOT** met/not completed.

** Students who *exceed* expectations *for a given* letter grade will earn the “+” letter designation. For example, a student aiming to complete the “B” letter grade requirements who completes more than four annotated bibliography entries, **OR** passes 2 out of 2 reflections, **OR** earns an E on the final project will earn a B+ letter grade. The peer score will not count towards the “+” designation.

** Students who do not complete **one (and only one)** of the specifications for the **annotated bibliography, reflections, or peer score** required for a letter grade will earn the “-” letter designation. **All components of the final project must be completed for the A and B letter grades.** For example, a student who earns an “M” score on the Final Project, with all other components completed for the A letter grade, will earn an A-. Another example is a student aiming to complete the “B” letter grade requirements, who completed only three annotated bibliography entries **OR** 0 out of 2 reflections, **OR** a Peer Score less than 0.8, will earn a B- letter grade. Students not successfully completing **more than one** of the requirements for a letter grade will be assessed as **not having met the requirements for that grade** and will drop to the next lower letter grade.

** Note that a grade of **F** will result if students do not successfully meet **all** of the D grade requirements.

To earn an A+, students must exceed *all* expectations for the A grade description (i.e. meet all the required components, complete more than five annotated bibliography entries, complete 2 out of 2 reflections, earn a Peer Score greater than 0.95, **AND complete the Final Project at the E standard).

** Students will be given *three ‘free passes’* that can be used to re-submit any written assignment to get the work to an “acceptable” standard. The free pass and re-submitted assignment must be submitted **within one week (7 days) of the graded assignment being returned or mark being posted.** There is only one re-submission per free pass, and the **Free Pass Form** must be completed and attached to the re-submitted assignment. Re-submitted material must also be accompanied by the original graded assignment and a brief statement (approximately one paragraph) describing how the student has revised their assignment according to that feedback. Free passes can also be used to hand in an assignment **up to 1 week AFTER the due date**, without penalty (excluding the final project and all drafts of the final project). Free passes are **not** transferable.**

TENTATIVE COURSE SCHEDULE

Week	Theme	Class Activities	Readings	Assessments
1 Sep 13	Welcome to Research on Global Challenges	Orientation and Introductions Course Outline Developing a Research Question	Course Outline Chapters 1 - 3	Research Survey #1 (Completed online) DUE: Sep 19 @ 11:59 pm
2 Sep 20	Ethical & safe research	Research Ethics & Safety Ready for Research Team Contracts	Chapter 4	Ready for Research form (Submit to Dropbox on D2L) DUE: Sep 26 @ 11:59 pm
3 Sep 27	Research planning & literature review	Literature Review (Librarian) Research Planning Guide	Chapters 5 - 7	Research Planning Guide (Submit to Dropbox on D2L) DUE: Oct 3 @ 11:59 pm
4 Oct 4	Research paradigms	Research approaches and methodologies Annotated Bibliography	Chapters 8 - 13	Annotated Bibliography #1 (Submit to Dropbox on D2L) DUE: Oct 12 @ 11:59 pm
5 Oct 11	NA	No class (Thanksgiving)	None	NO ASSESSEMENTS DUE
6 Oct 18	Reflection	Why is reflection important? What is the DEAL framework?	None	Reflection #1 (Submit to Dropbox on D2L) DUE: Oct 24 @ 11:59 pm
7 Oct 25	Data management	Best practices for data management and metadata; creating a team data management plan	None	1. Annotated Bibliography #2 (Submit to Dropbox on D2L) DUE: Oct 31 @ 11:59 pm 2. ITP Metrics survey #1 (Completed online) DUE: Oct 31 @ 11:59 pm
8 Nov 1	Team Health	Working collaboratively during research; using the CARE model for team development	None	1. Team Health Report (Completed in class & submit to Dropbox on D2L) 2. Annotated Bibliography #3 (Submit to Dropbox on D2L) DUE: Nov 14 @ 11:59 pm
9 Nov 8	TERM BREAK			NO ASSESSEMENTS DUE
10 Nov 15	Writing about research, writing abstracts	Getting started with writing; making writing a habit; what makes a great abstract?	Chapter 15	Annotated Bibliography #4 (Submit to Dropbox on D2L) DUE: Nov 21 @ 11:59 pm
11 Nov 22	Analyzing & presenting data	Principle of data visualization; presentation of pre-liminary results	Chapter 14	Reflection #2 (Submit to Dropbox on D2L) DUE: Nov 28 @ 11:59 pm
12 Nov 29	Project progress update, check-in, questions	Progress check, support	None	NO ASSESSEMENTS DUE
13 Dec 6	Draft Final Project Peer Feedback Course wrap-up and celebration	Peer Feedback; celebration of learning; wrap-up	None	1. Draft Final Project (Submit to Dropbox on D2L) DUE: Dec 6 @ 10:00 am 2. Final Project (Submit to Dropbox on D2L) 3. Research Survey #2 (Completed online) 4. ITP Metrics Survey #2 (Completed online) DUE: Dec 9 @ 11:59 pm

The above schedule is a list of topics for class, associated readings, and assignment due dates. The schedule will remain **flexible** to accommodate themes identified by students, questions and conversations that emerge as the course progresses. Students will be notified of all changes promptly by email and D2L announcements.

ATTENDANCE, ENGAGEMENT AND CRITICAL REFLECTION EXPECTATIONS

Given the experiential learning structure of the UNIV 302 course, attendance at classes is essential. Students are **expected to attend classes and engage as active participants in the inquiry process**. A detailed engagement and critical reflection rubric will be provided at the beginning of the term so that you know what to expect.

REQUIREMENTS AND GUIDELINES FOR CITING SOURCES

In all course work, you must indicate where you have gotten your information from. This extends to both peer-reviewed and popular sources of writing, images, video, music, and multi-media evidence. While we don't expect stylistic perfection in citations, we ask that students try to use the APA citation style. Guidelines for using APA can be found at the Purdue Writing Lab website: <https://owl.english.purdue.edu/owl/resource/560/01/>

GUIDELINES FOR SUBMITTING ASSIGNMENTS

Assignments should be submitted using D2L and are due by 11:59 pm on the day listed on the schedule unless otherwise indicated by the instructor.

INTELLECTUAL PROPERTY

Course materials created by the professor(s) remain the intellectual property of the professor(s). These materials may not be reproduced, redistributed or copied without the explicit consent of the professor. The posting of course materials to third-party websites such as note-sharing sites without permission is prohibited. Sharing of extracts of these course materials with other students enrolled in the course may be allowed under fair dealing.

Appendix D: PURE EDI Demographic Infographic

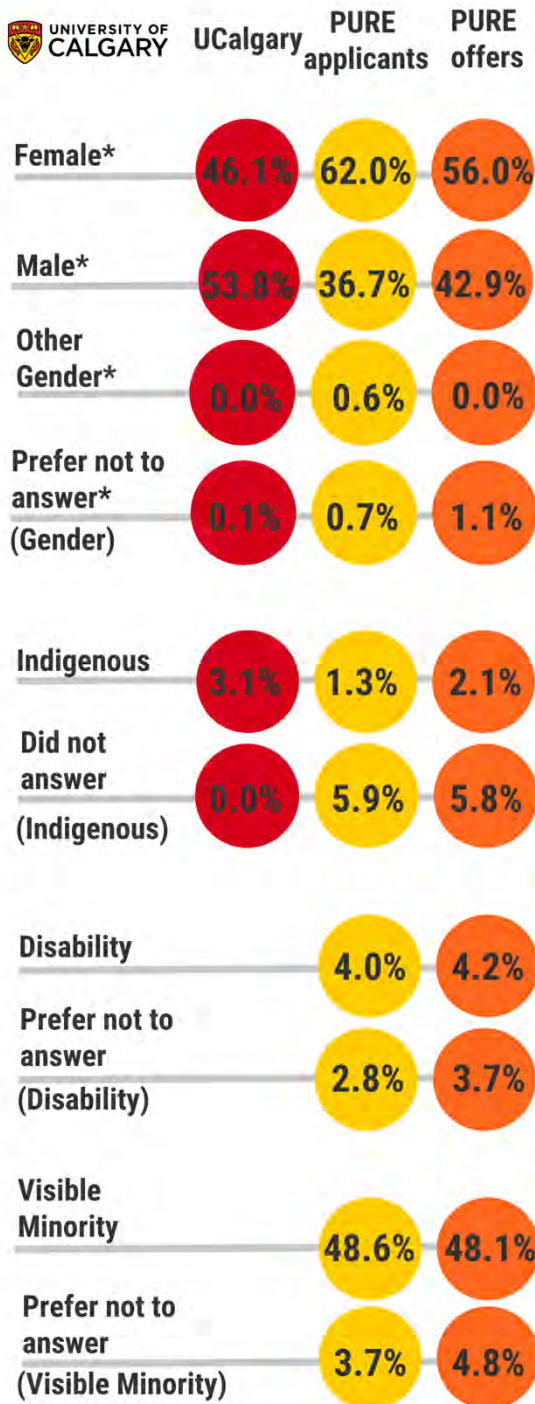


Figure 1: All self-identified EDI demographics analyzed for the UCalgary student population (UCalgary), all PURE eligible applicants (PURE applicants), and eligible applicants that were offered awards. "Other Gender" refers to gender non-conforming responses.

PURE Awards 2021 EDI analysis summary

Objectives

- 1 Evaluate the response rates for all demographic questions in PURE applicants.
- 2 Compare EDI demographics of PURE applicants with UCalgary undergraduate student demographics.
- 3 Evaluate the PURE award adjudication process for biases.

Conclusions

- 1 There is **some hesitancy to answer demographic questions**, especially Indigenous, disability, and visible minority self-identification questions.
The PURE gender and Indigenous self-identifying EDI demographics are different compared to the general UCalgary student population. Males and Indigenous identifying students are under-represented in PURE.
- 2 **The adjudication process is unbiased.** There is no difference in the demographics of students who apply for PURE and those who are awarded.
- 3

*Note that this survey question was administered with male, female, and prefer not to answer as options. We recognize that male and female are inappropriate terms to use when describing gender but did not want to misrepresent the collected data.

Appendix E: EDI Recommendations

CATEGORY	RECOMMENDATION
Inclusive messaging	<ul style="list-style-type: none"> • Change the name of PURE • Develop an EDI Statement and an Indigenous Statement for PURE • Incorporate EDI-focused learning goals into the PURE learning outcomes
Gathering a diverse group of applicants	<ul style="list-style-type: none"> • Open PURE to part-time students • Create part-time PURE awards • Lower or remove GPA threshold • Incorporate Universal Design for Learning (UDL) principles into the application process • Allow students to apply for collaborative PURE awards • Offer targeted recruitment sessions • Encourage students seeking a research supervisor to consider the supervisor's mentorship practices and research environment • Include a Land Acknowledgement and relationship to the land for the proposed Research • Require students to outline research milestones or objectives for the proposed Research • Require supervisors to include a statement on how they will create an inclusive research environment
Selection methods	<ul style="list-style-type: none"> • Support reviewers and coordinators in the adjudication process to ensure selection processes consider Indigenous principles and equity, diversity, and inclusion principles • Develop a set of targets linked to the disciplinary diversity of the entire campus • Implement EDI-targeted awards
Inclusive programming	<ul style="list-style-type: none"> • Develop and support a peer-mentorship network focused on undergraduate Research • Develop an EDI-focused workshop for students • Support supervisors developing an inclusive and safe research environment for students • Incorporate Universal Design for Learning (UDL) principles into PURE programming
Collection and use of data	<ul style="list-style-type: none"> • Modify the EDI demographic questions in the application form • Report on EDI demographics