

UNIVERSITY OF CALGARY | Taylor Institute for Teaching and Learning

# **Undergraduate Research Initiative (URI) Report**

# 2021-22

Prepared By: Rachel Stewart, Dr. Kyla Flanagan, Andel Anderson, Saskia-Mae Livingstone, Reyam Jamaleddine



# **Executive Summary**

In this report, we, the Undergraduate Research Initiative (URI) Team, summarize the activities and impact of the URI's signature programs from July 2021 to December 2022. To capture the story of URI's work during this time, this report is organized by the URI's six strategic areas. All insights were collected through diverse program evaluation research methods focused on participant outcomes. They are reported alongside mini-stories of some of the diverse students, instructors, and staff engaged in undergraduate research. Throughout 2021-22, the URI has supported over **2,400** undergraduate students conducting research, up from 1,600 in the *2020-21 Undergraduate Research Initiative (URI) Report*. During this time, 271 instructors facilitated or supervised undergraduate research activities, and 18 research coaches mentored undergraduate researchers. Throughout, there were 29 community partnerships, including partners, community members, and publicly available data to enliven the research relevance and experience for students.

# **Delivering Undergraduate Research Experiences**

The URI has four signature programs: course-based undergraduate research experiences (CURE), the Program for Undergraduate Research Experience (PURE) Award, the Ready for Research Badge, and Research on Global Challenges (UNIV 302). In 2021-22, we saw steady growth in engagement with CURE and the PURE Award, an enthusiastic launch to Ready for Research, and transformational impacts on student learning for UNIV 302.

# **Reducing Barriers and Increasing Access**

This strategic area has seen intentional inputs and engagement in all four signature programs. A team of instructors from the Schulich School of Engineering offered the first CURE to 500+ students. The PURE Award published and completed 14 out of 23 recommendations in the *Equity, Diversity, and Inclusion (EDI) Action Plan (2021)*. UNIV 302 sparked the consultation captured in the *Increasing Student Engagement in the Undergraduate Research Initiative Report (2022)*. Lastly, Ready for Research launched with 700+ undergraduate students enrolled.

# **Building Networks and Sharing Knowledge**

The instructors and students engaging in the URI's programs have reached national and international conferences and readers via several presentations and publications on their undergraduate research experiences. Members of the URI team have also shared their scholarship, experiences, and reflections via conference presentations, workshops, and publications. In this section, we also highlight the PURE Award Faculty Coordinators, whose leadership within their faculties ensures the successful identification of each year's PURE Award cohort and PURE Award students and supervisor success within their faculties.

# **Developing Resources and Faculty-Development Programs**

This strategic area saw much collaboration between the URI team and students, librarians, and instructors. Members of the URI Team collaborated with instructors highly engaged in facilitating and mentoring undergraduate research to write <u>A</u> <u>Guide to Undergraduate Research at UCalgary (2022)</u>. For CUREs, Kara Loy, Educational Development Consultant, collaborated with a student partner and Libraries and Cultural Resources to create a LibGuide for students and instructors engaging in undergraduate research. Kara also facilitated the training and development of CURE research coaches and developed and implemented the Designing a CURE Badge program for instructors and postdoctoral scholars.

# **Engaging with Community Partners**

Instructors and students in CURE, PURE Award, and UNIV 302 engaged with diverse community partners in their undergraduate research activities. In 2022, five courses containing CUREs featured community partners and engaged with community members or publicly available data to enrich the undergraduate research experience. In 2021-22, 16 PURE Award recipients reported collaborating with community partners throughout their research. In 2021, two UNIV 302 research streams engaged community partners. One of these partnerships continued to become two CUREs and a MITACS grant to support four undergraduate research positions with the Alberta Institute for Wildlife Conservation. Preference for these positions will be given to Indigenous students.

# **Communicating Impact**

In this strategic area, we communicate the value and impact of undergraduate research and celebrate faculty and student achievements. In 2021-22, many CURE instructors were honoured with awards and recognition, and multiple students collaborated on a publication on their CURE experience. We collected 21 mini-stories from recipients of the PURE Award to learn more about the stories connected to PURE Award student outcomes. In 2021, Dr. Kyla Flanagan (CDCI Academic Lead) received a McCaig-Killiam Teaching Award and was nominated for a 3M National Teaching Fellowship for her work in undergraduate research. Lastly, two UNIV 302 research stream supervisors were honoured with prestigious teaching awards for mentoring undergraduate research and other forms of experiential learning.

# What's Next?

For 2023 and beyond, we will continue to focus our work in all six of our strategic areas, particularly delivering undergraduate research experiences and committing to reducing barriers and increasing access. Beginning this summer, the PURE Award workshop series and micro-credential will be open to NSERC Undergraduate Student Research Award (USRA), NSERC USRA-Black student awardees, and Alberta Innovates summer students. In partnership with the Office of Equity, Diversity, and Inclusion (OEDI) and VP-Research offices, we will co-facilitate the summer workshop series and provide guidelines on best practices based on lived experience related to EDI in labs and research teams. For Indigenous Engagement, we will continue using and enacting the 15 recommendations in the *Increasing Student Engagement in Undergraduate Research Initiatives* report. In collaboration with colleagues in the Office of Experiential Learning, we will develop resources and create faculty development opportunities that will focus on EL broadly but also undergraduate research specifically. Throughout, we will re-evaluate our faculty support model for undergraduate research. We will continue our commitment to storytelling, reporting, evaluation, and sharing the story of UR at UCalgary.

# **Table of Contents**

Introduction	1
Delivering Undergraduate Research Experiences	6
Reducing Barriers and Increasing Access	13
Building Networks and Sharing Knowledge	17
Developing Resources and Faculty-Development Programs	19
Engaging with Community Partners	21
Communicating Impact	23
What's Next	27
Appendix A: CURE Program Outcomes	28
Appendix B: PURE Award Outcomes	28
Appendix C: Ready for Research Outcomes	29
Appendix D: Research on Global Challenges	29
Appendix E: Recommendations in Increasing Indigenous Engagement in Undergraduate Research Initiatives .	30
Appendix F: PURE Award Mini-Stories	31

# 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 <u>Academic</u> and <u>Research</u> 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 directives 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 *Research-Based Experiential Learning*, one of the categories of Experiential Learning Plan (2020-25). The CDCI supports the *Experiential Learning Plan* by expanding capacity, reducing barriers, and increasing opportunities for students to participate in research.

In this report, we, the URI Team, report on evaluation research on the impact of our programs between Summer 2021 and Fall 2022. Building off the analyses and findings in the <u>2020-21 Undergraduate Research Initiative Report</u>, we continue to explore the objectives, activities, and impact of the URI's four signature programs on program participants and partners. This report is organized by our six strategic areas:

- Delivering undergraduate research experiences
- Reducing barriers and increasing access
- Building networks and sharing knowledge
- Developing resources and faculty-development programs
- Engaging community partners, and
- Communicating impact

Each section integrates evidence from program evaluation research with storytelling to highlight the experiences and milestones of participating undergraduate students, instructors, research coaches, and us, the URI Team. To close, we share what's next for the URI.

# **Undergraduate Research Initiative (URI)**

Undergraduate research is a mentored investigation involving a researchable question or research 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' research skills, scholarship, or creative expression. In the CDCI, we have focused on building 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*. This URI Framework (Figure 1) was developed based on the extensive literature on undergraduate research integrated with the UCalgary campus context, *Experiential Learning Plan*, and our team's previous undergraduate research experiences.

The URI partners with various units across campus, including the Provost, Vice-President (Research), and the Vice-Provost (Teaching and Learning) portfolios, to explore undergraduate research in various spaces:



## FIGURE 1 UNDERGRADUATE RESEARCH INITIATIVE FRAMEWORK

- Curricular course-based undergraduate research: Curricular undergraduate research experiences are academic courses designed to include a significant research component. Here, we focus on exploring incorporating research into the curriculum for high enrolment first- and second-year courses.
- Co-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) Award, 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.

# **Signature Programs**

The URI comprises four signature programs. Each initiative provides undergraduate students a unique path to engage in undergraduate research. In 2021-22, these programs supported and engaged 2,400 students, 271 instructors and supervisors, 18 research coaches, and 29 community partnerships. See Table 1.

Initiative	# Students	# Instructors	# Research Coaches	# Community Partnerships*
CURE	1,361	14	13	11
PURE Award	273	251	-	16
UNIV 302	52	6	5	2
Ready for Research	714	-	-	-
TOTAL	2,400	271	18	29

## TABLE 1 URI PARTICIPANTS, JULY 2021-DECEMBER 2022

\*Includes community partners, community members, and publicly available data to enliven the research relevance and experience for students.

## **Course-Based Undergraduate Research Experience (CURE)**

A course-based undergraduate research experience (CURE) is when a research 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. See Appendix A for program outcomes.

The CDCI supports course instructors in developing a CURE in a new or existing course. Supports include:

- Educational development support from Kara Loy (Educational Development Consultant: Experiential Learning & Undergraduate Research)
- Designing a Course-based Undergraduate Research Experience (CURE) Badge
- Unique workshops and faculty-development sessions
- Involvement in 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 research coaches, a graduate or upper-level undergraduate student with research experience who can dedicate up to 20 hours per week to supporting a CURE.

## Program for Undergraduate Research Experience (PURE) Award

The Program for Undergraduate Research Experience (PURE) Award has provided immersive, experiential, hands-on research opportunities for undergraduate students to collaborate with the University of Calgary Faculty members for over a decade. The PURE Award provides individual students with up to \$7,500 of financial support to undertake an 8, 12, or 16-week research project 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. Two additional experiential learning programs are affiliated with the PURE Award: 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 Award research. See Appendix B for program outcomes.

## **Ready for Research Badge**

The Ready for Research badge provides a new pathway for undergraduate students to engage in research, thus increasing student access to research experiences across campus. Research-focused workshops are offered annually every two weeks from early October through mid-March in collaboration with faculty members and staff from across campus. To earn the badge, students attend four required workshops and select two optional workshops from a list of eight. Afterwards, students submit a badge passport, where they reflect on the workshops attended and create a learning plan, setting their intention to participate in research. See Appendix C for program outcomes.

## UNIV 302: Research on Global Challenges

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 <u>United</u> <u>Nation's Sustainable Development Goals</u>. Students explore responses and solutions to global challenges in a relevant global context. Students develop fundamental research, teamwork, problem-solving, and collaboration skills in this unique course. See Appendix D for program outcomes.

See Figure 2 for a journey map of our programs since 2020.

## FIGURE 2 URI SIGNATURE PROGRAMS: JOURNEY MAP



## **Strategic Areas**

The URI develops undergraduate research through work in six strategic areas:

- Delivering curricular and non-curricular undergraduate research experiences: Deliver curricular and non-curricular undergraduate research experiences and support an increasing number of course-based undergraduate research experiences across multiple faculties.
- Reducing barriers and increasing access: Identify and reduce the potential barriers to accessing undergraduate research at UCalgary, particularly those experienced by equity-deserving students, such as women and gender nonconforming identities, Indigenous persons, racialized minorities, 2SLGBTQIA+, and persons with disabilities.
- Building networks and sharing knowledge: Build and network connections with faculty members and units across campus and sharing our research, experiences, and reflections with the campus and scholarly community.
- Developing resources and faculty-development programs: Develop undergraduate research experience learning
  resources and programs, including open-access research videos, faculty guides, communities of practice, workshops,
  and micro-credentials.
- Engaging with community partners: Nurture opportunities for community-integrated undergraduate research. Maximize undergraduate research impact on local, national, and international communities. Supporting others engaging in research with community partners
- 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 external partners.

Concerning our strategic areas, each URI program has undergone significant activity and growth. See Figure 3 for a journey map detailing key milestones in each strategic area. Each strategic area and program milestone are discussed in detail in their respective section of the report. Throughout each section, URI program milestones are accompanied by insights from program evaluation research and storytelling of the diverse impact and outcomes URI programs have had on partners and participants.

Legend: 🔍 URI	CURE OURE Award Ready for Rese	earch – UNIV 302
Strategic Areas	2021	2022
Deliver undergraduate research experiences	<ul> <li>Four CUREs in four faculties</li> <li>PURE Award: 151 recipients, 135 supervisors</li> <li>Program development</li> <li>UNIV 302: Five research streams</li> </ul>	<ul> <li>Eight CUREs in two faculties</li> <li>PURE Award: 122 recipients, 116 supervisors</li> <li>Program launch</li> </ul>
Reducing barriers and increasing access	<ul> <li>First CURE in a course with 500+ students</li> <li>Equity, Diversity, and Inclusion (EDI) Action Plan</li> </ul>	<ul> <li>Program launched with 700+ students enrolled</li> <li>14 of 23 EDI Action Plan recommendations enacted thus far</li> <li>Increasing Indigenous Engagement in Undergraduate Research Report</li> </ul>
Building networks and sharing knowledge	<ul> <li>Two workshops and one conference presentation</li> <li>International conference presentation</li> <li>Research stream supervisor and student presentation and publication</li> </ul>	<ul> <li>One conference presentation and one workshop</li> <li>Two international conference presentations</li> <li>Two research stream supervisor and student publications</li> </ul>
Developing resources and programs	<ul> <li>Student Resource LibGuide published</li> <li>Research coach training developed</li> </ul>	<ul> <li>A Guide to Undergraduate Research at UCalgary</li> <li>Instructor Resource LibGuide published</li> <li>Chapter published in Cambridge Handbook of Undergraduate Research</li> <li>Designing a CURE Badge program developed and launched</li> </ul>
Engaging with community partners	<ul> <li>10 recipients report engaging community partners</li> <li>Two research streams engage community partners</li> </ul>	<ul> <li>Five CUREs with community partners</li> <li>Six recipients report engaging community partners</li> </ul>
Communicating impact	<ul> <li>2020-21 Undergraduate Research Initiative Report</li> <li>CURE instructor elected to General Council of Council of Undergraduate Research</li> <li>Celebration of Achievement</li> <li>PURE Awardees featured in three UToday stories</li> <li>UNIV instructor and research stream supervisor honoured with McCaig-Killam Teaching Awards</li> </ul>	<ul> <li>Four CURE instructors honoured with awards and recognition</li> <li>CURE instructors and courses featured in three UToday stories</li> <li>Celebration of Achievement</li> <li>21 student mini stories collected and shared</li> <li>PURE Awardees featured in two UToday stories</li> <li>UNIV instructor honoured with UCalgary Teaching and Learning Award</li> </ul>

## FIGURE 3 URI JOURNEY MAP: STRATEGIC AREAS (SUMMER 2021-WINTER 2022)

# **Delivering Undergraduate Research Experiences**

We deliver curricular and non-curricular undergraduate research experiences in this strategic area, including the PURE Award, Research on Global Challenges (UNIV), and the Ready for Research Badge. We support an increasing number of CUREs across multiple faculties. In 2021-22, the URI has supported 2,425 undergraduate students conducting research, 273 instructors facilitating or supervising undergraduate research projects, 18 research coaches mentoring undergraduate researchers, and 15 community partners.

## CURE

From Fall 2021 to Fall 2022, 16 course instructors and 13 research coaches facilitated 12 CUREs in four faculties in second, third, and fourth-year undergraduate courses. Across these courses, there were 1,361 students enrolled. See Table 2.

Semester	Faculty	Course	Course Instructor(s)	# Research Coaches	# Students Enrolled
Fall 2021	Arts	COMS 591: Senior Seminar in Communication and Media	Dr. Victoria Guglietti	1	29
	Kinesiology	KNES 375 Tests and Measurements in Kinesiology	Dr. John Holash	1	77
	Schulich	ENDG 319: Probability, Statistics and Machine Learning	Drs. Kazi Sumon, Md Kibria, Josephine Hill, Sameh Nassar & Ali Shayete Zeraati	2	564
	Science	ZOOL 267: Animal Behaviour	Dr. Mindi Summers	1	94
Winter 2022	Arts	INDG 502: Advanced Topics in Canadian Indigenous Studies	Dr. Adela Kincaid	1	20
		ITAL 399: Topics in Italian Masterpieces – Film & Literature	Dr. Eleonora Buonocore	1	33
		SPAN 505: Advanced Spanish	Dr. Angela George	1	25
		SPAN 508: Introduction to Spanish Sociolinguistics	Dr. Angela George	1	20
	Science	BIOL 313: Principles of Ecology	Dr. Ariane Cantin	1	398
Fall 2022	Arts	COMS 591: Senior Seminar in Communication and Media	Dr. Victoria Guglietti	1	25
		INDG 415: Indigenous Ethics and6 Protocol	Dr. Adela Kincaid	1	15
	Science	ZOOL 435: Entomology	Dr. Ogonna Nwankwo	1	61

## TABLE 2 CURE COURSES AND ENROLLMENT 2021-22

At the end of each semester, we seek to assess what students have gained from their CURE experience related to CURElevel learning outcomes via an optional online survey. This survey consists of 21 Likert-style, multiple-choice, and shortanswer questions.

Across all eleven CUREs between Fall 2021 and Fall 2022, 94 survey respondents were prompted to identify research activities they completed as part of their CURE experience. For each research activity, respondents reported their level of agreement from "strongly agree" to "strongly disagree." The top-three reported research activities were "I analyzed and

interpreted data in the research experience," "I communicated my research experience," and "I collected/contributed data in the research experience". The research activity with the most varied responses was "The research experience was adequately supported by the instruction." See Figure 4.

## FIGURE 4 2021-22 CURE EXIT SURVEY



In the short-answer section of the survey, respondents shared diverse outcomes from their CURE experiences. As we saw in 2020-21, much of this learning was discipline-specific. Yet, many students commonly reported an enhanced understanding of a specific element of the research process and their research interests. As one respondent shared:

"

"[As a result of this research experience,] I have a better understanding of how important it is for protocols to be practiced (i.e., undergo beta-testing) given that doing so definitely helps work out unforeseen problems relating to efficiency and the collection of quality data." CURE Student

New to this year, some respondents also reported new or enhanced learning of conducting research with a team or students in other majors.

"[As a result of this research experience,] I have a stronger understanding of what collaborative research is and what my expectations are in terms of group work. In terms of the research itself, I was able to use my personal knowledge to tailor the project towards my own interests, while collecting new information from other resources." (CURE Student)

## **PURE Award**

Since 2018, the Provost (Vice-President Academic) and Vice-President (Research) offices have provided equally matched funding for the PURE Award as a unique program that profoundly contributes to the Academic Plan's goals of enhancing student experience and impact. Faculties can also fund PURE Award students within their units via faculty-funded awards. See Table 3.

## TABLE 3 PURE AWARD 2021-22

Year	\$ Total Funds	\$ Faculty-Funded Awards	# Students	# Supervisors
2021	\$849,000	\$144,000	151	135
2022	\$856,855	\$82,500	122	116

In 2022, PURE supported the research of 122 students and 116 supervisors between May and August. A total of 550 students applied for PURE in 2022. In 2022, PURE applicants' overall success rate, including Faculty-funded awards, was 22%. See Figure 5.

#### - Number of Applicants Number of Recipients # OF STUDENTS YEAR

## FIGURE 5 NUMBER OF PURE AWARD APPLICANTS AND RECIPIENTS (2015-2022)

The PURE Award is funded primarily by the Provost and Vice-President (Research). The PURE Award team also supports faculty-funded PURE Awards, where faculties allocate funds to PURE Awardees within their respective faculty. In 2022, we received \$82,500 from Faculties. With these funds, 11 additional students received PURE Awards. Consistent with previous years, most PURE students reported being in their third year (33%) and applied for a 16-week research term (82%).

The student PURE experience includes a student orientation and a series of workshops. We created the Research Skills Foundation Badge to celebrate students' participation in these workshops. This optional micro-credential allows students to articulate their research skills developed through the PURE Award programming in a sharable, 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 2022, 26 (21%) out of 122 students earned this elective micro-credential, consistent with the previous year when 29 (19%) out of 151 students earned the badge.

The Graeme Bell Travel Award (GBTA) financially supports PURE Award student researchers interested in travelling to conferences or symposiums to share their research findings. This year, the two GBTA recipients come from the Faculty of Arts and the Cumming School of Medicine. These students present their PURE Award research at international conferences in Edinburgh, Scotland and Munich, Germany.

To evaluate the impact of the PURE Award, we collect feedback at the start and end of the term through entry and exit surveys for both students and supervisors. This evaluation research aims to learn what students and supervisors gain from their PURE Award experience in relation to the program's outcomes. Completing these surveys is optional, and findings are used for continuous program learning and innovation.

## **PURE Students**

Student survey responses continue to demonstrate PURE's positive impact on student learning and experience. Like last year, students report that the PURE Award is a uniquely transformative experience for students' research skills and identity. We continue to see two prominent characteristics of PURE Awardees. First, they are impacted by faculty and mentor encouragement to apply for the PURE Award. In 2022, 49% of students reported first hearing about the PURE Award from a faculty member, up from 42% in 2021 and consistent with 49% in 2020. Second, over half (58% in 2022) of students report no prior research experience. This is consistent with previous years.

At the start of the PURE Award, students estimate the extent of their research skills in several areas. In 2022, most students estimated their research skills between "a moderate amount" and "a great deal." This is consistent with previous years. In the exit survey, students estimated how much the PURE Award improved their research skills. Most 2022 students estimated their skill levels had increased between "a moderate amount" and "a great deal." See Figure 6.



FIGURE 6 2022 PURE AWARD EXIT SURVEY: IN TERMS OF RESEARCH SKILLS, ESTIMATE THE EXTENT TO WHICH THE PURE AWARD IMPROVED YOUR ABILITY IN THE FOLLOWING AREAS (N=30)

Later in the exit survey, students were prompted to reflect on one research skill they have gained or amplified because of the PURE Award. Between 2021 and 2022, there were slight shifts in respondents' themes. On the one hand, in 2021, the top three themes related to conducting a literature review (28%), communicating in research (20%), and collecting, interpreting, and analyzing data (20%). On the other hand, in 2022, the top three themes related to understanding the

nature of research in their field (28%), communicating to different audiences (24%), and collecting and organizing data (16%). In the words of one student:

I gained many research skills doing my PURE term, one of the most gained and important skills was the ability to plan out experiments that will help me to better understand and answer my research question. It was hard at first to be able to relate the experiments I needed to plan and think of to my research question, but throughout the summer it became clearer why the data I was collecting was important for my project and how this data then shaped and changed my approach as the project progressed. 2022 PURE Award Student

Students' gained or amplified research skills led to new or evolved understandings of their research identity. Throughout the student exit survey, respondents described new or evolved research identities based on their experiences conducting research and their self-confidence in their knowledge, skills, and abilities. Many key themes throughout survey responses overlapped with previous years, e.g., "I know more about my interests" and "I feel more confident in my abilities." 2022 respondents strongly emphasize the connection between their research skills and identity concerning their future. While the nature of these plans varied across respondents, respondents shared uniquely personal impacts of their new or growing research identity. As one respondent shared, "I have gained confidence in my personal identity as I have become more attuned to the interrelation in how my identity informs my career and have thus learned more about why I chose such a field in the first place, when considering my upbringing."

## **PURE Award Supervisors**

The core of the PURE Award 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. Throughout the PURE Award, supervisors are invited to a Supervisor Orientation at the beginning, sent a monthly newsletter, and invited to the Celebration of Achievement at the end.

In the supervisor exit survey, we ask supervisors to describe how they would describe their experience of supervising a PURE Award recipient to a colleague. Across responses for both 2021 and 2022, the top three themes were:

- The PURE Award is "a great opportunity" to work with enthusiastic students, expand your research team, and explore
  your research interests.
- PURE Award recipients are "amazing" and "highly motivated," making mentoring rewarding.
- The PURE Award is a "well-run program" that provides valuable funding.

In addition, in 2021 and 2022, survey respondents who are first-time PURE Award Supervisors distinctly recommended additional resources on undergraduate mentorship and additional events to connect with other supervisors and students.

## Dr. Roswita Dressler, PURE Supervisor, Werklund School of Education

I first learned of the PURE Award when my daughter was a linguistics student, and I was doing my doctorate. She didn't know how to pursue the opportunity, so I recommended she approach a professor and ask, "what's something you are really curious about right now?". It worked! She had a fabulous time, and I knew it was something I wanted to be part of, too. To date, I've mentored four PURE Award students, amongst others. The enthusiasm of undergraduate researchers is infectious. It's always interesting to look at research through the eyes of someone doing it for the first time. It prompts you to reflect on things like trustworthiness and reliability. Students may come with background assumptions like, "only statistics count as research" or "research usually takes place in lab" but that's not the case in education. As they embed themselves in the literature, they become very immersed in the learning experience, and you can enjoy it alongside them.



FIGURE 7 ROSWITA DRESSLER. IMAGE PROVIDED BY R. DRESSLER

## **Ready for Research**

The Ready for Research Badge launched in October 2022. To date, the program has offered eight workshops. See Table 4.

## TABLE 4 READY FOR RESEARCH WORKSHOPS AND ATTENDANCE

Required/Optional	Workshops to Date	# Participants
Required	Getting Involved in Undergraduate Research at UCalgary	715
	Integrity and Ethics in Undergraduate Research	362
	Applying for Undergraduate Research Funding (Session 1)	357
	Applying for Undergraduate Research Funding (Session 2)	296
Optional	Creativity in Research: Getting to a Research Question	213
	Findings Sources to Inform Your Research	131
	Organizing, Managing, and Citing Your Sources	117
	The Basics of Project and Data Management Planning for Research Projects	122

After each workshop, participants are asked to complete a brief workshop evaluation survey. Each survey invites participants to share valuable learning from the workshop. The second survey question, "what is the most valuable thing you learned in this workshop?", captures how the program is meeting its diverse participants wherever they are in their undergraduate research journeys.



"That I already possess many key research skills, but that with practice I can learn to grow and further develop these skills."

"That there are numerous opportunities in research to get involved with professors, and peers and the collaboration is extremely helpful in building connections to your community."

"That a majority of the other students are in the same spot as me. I've always been worried that I was 'behind in life'. But seeing that that is not the case gave me so much hope that I will be able to achieve my dreams!"

## Andel Anderson, Experiential Learning Specialist, Taylor Institute for Teaching and Learning

In my role, I support undergraduate research broadly and the PURE and Ready for Research programs specifically. This work is about equipping students to start their own research journey. It's funny, I had no prior knowledge of research before this role. When I thought of research, I thought of labs, but I soon learned research can happen in any discipline. One student from Fine Arts really broadened my perspective. Her PURE Award research was skin lightening treatments, and she shared her findings as an art showcase. For her to realize that she could do this amazing project on something that impacts so many communities, was profound. Students like her make me so glad we are making opportunities for undergraduates to dive into research. Many students have questions and curiosities, but previously, opportunities to explore them weren't available or accessible. With Ready for Research, students can start whenever they are interested and ready, even as soon as first year.



FIGURE 8 ANDEL ANDERSON. IMAGE PROVIDED BY A. ANDERSON

# **UNIV 302: Research on Global Challenges**

UNIV 302 is a CURE that allows students to explore interdisciplinary and multidisciplinary solutions to global challenges. In fall 2021, the URI offered UNIV 302, with five research streams, five research stream supervisors, five research coaches, and 50 undergraduate students from seven faculties. See Table 5.

## **TABLE 5 UNIV 302 RESEARCH STREAM PARTICIPANTS**

Research Stream	Research Stream Supervisor	Research Stream Supervisor's Faculty	# Students Enrolled	Students' Faculties
Digital Worlds	Dr. Christian Jacob	Science	10	Arts, Haskayne, Schulich, Science
Conserving Freshwater Ecosystems	Dr. Christie Sampson	Science	11	Arts, Schulich, Science
Humans, Animals, and the Environment	Dr. Adela Kincaid	Arts	6	Arts, Science
Indigenous Experiences with Police	Dr. Adam Murry	Arts	12	Arts
Toward a More Accessible Canada	Dr. Victoria Fast	Arts	11	Arts, Kinesiology, Haskayne, Medicine, Science

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's experience. These activities aim to assess the outcomes, strengths, challenges, and impact of UNIV courses. Entry and exit survey findings are summarized in the <u>2020-2021</u> <u>Undergraduate Research Initiative Report</u>. To learn about the ongoing impacts of UNIV 302, we contacted the research stream supervisors to learn about the impacts they have witnessed in UNIV 302 students and, where applicable, their community partners. In these correspondences, we have heard many of their research stream students have continued their research on global challenges via publications, conference presentations, honours theses, or graduate school applications. Many research stream supervisors have written reference letters supporting many, or in some cases, nearly all research stream students applying to graduate school or working in their field or with not-for-profits. Some research stream supervisors continue to hear comments from former students and research coaches that UNIV 302 provided experiences and growth opportunities they would not have had otherwise.

## Habeebah Adeladan (Arts)

My experience with undergraduate research started in UNIV 302. I was in Dr. Kincaid's research steam, 'Animals, Humans, and the Environment'. I didn't have prior research experience, but I knew I was interested in trying it. I grew so much as a student and a researcher from this experience. Particularly, I learned that climate change on animals substantially impacts humans and that the only way to solve global challenges is if people from different disciplines work together – siloed approaches don't work. Afterwards, I joined the co-op program. Research really prepared me for the corporate world. Both worlds have common ground in the human component. You need to communicate and collaborate, and think about a lot of similar things, like funding, timing, and resources. Hiccups might feel like defeat in the moment, but you've got to keep re-evaluating how to reach your goal. Presently, as I finish my undergraduate program, I keep reflecting on two things: that there's no such a thing as local or national anymore, and that I want to be part of solving global challenges. I'm applying to the master's in public health (MPH) program at the University of Alberta, where I hope to study communicable diseases, climate change, and health. No matter the global challenge, but it on a small or large scale, I want to work with others towards solving it.



FIGURE 9 HABEEBAH ADELADAN. IMAGE PROVIDED BY H. ADELADAN

# **Reducing Barriers and Increasing Access**

In this strategic area, we work to identify and reduce the potential barriers to accessing undergraduate research at UCalgary, particularly those experienced by equity-deserving students, such as women and gender non-conforming identities, Indigenous persons, racialized minorities, 2SLGBTQIA+, and persons with disabilities.

## CURE

A defining characteristic of a CURE is that they can be offered in any field of study or discipline and in nearly every undergraduate course, regardless of class size and remote, blended, or in-person learning contexts. This flexibility and adaptability make CUREs an impactful strategy to reduce barriers and increase access to undergraduate research. In 2021, Drs. Kazi Sumon, Md Kibria, Josephine Hill, Sameh Nassar and Ali Shayete Zeraati offered a CURE in ENDG 319: Probability, Statistics and Machine Learning, the first with over 500 students enrolled.

## Dr. Kazi Sumon, Schulich School of Engineering

ENDG 319 is a class on probability and statistics with over 500 students. Students typically perceive it as difficult, dry, and unconnected to the real-world. As an instructor, I am always thinking about how to add value to the course. In life, there's lots of uncertainty, and the mathematical principles in this course can provide ways to interact with this uncertainty, but how do my colleagues and I make this clear to students? Currently, the course integrates course-based undergraduate research experiences (CURE) focusing on machine learning. Students collect their own data, apply machine learning, and solve whatever problem is embedded in their data selection. It's exciting to see students choose data from so many areas. They aren't creating a traditional "scientific" research question, but they are exploring where topics for potential research questions exist in the real world and connecting those topics to the course content. Getting EDNG 319 to this stage was a process of implementing small elements of CUREs over time. We use the research skill development framework as a guide. It doesn't need to be a big change to the course. When I first heard about CUREs in 2019, I was hesitant to implement research in such a large class, but now, I believe that the size of the course isn't important, it's how the instructors understand the connections between the CURE and the course learning outcomes. Ultimately, it's about supporting students in their learning as scientists, designers, and engineers. My colleagues and I feel there's more potential to amplify the CURE in ENDG 319, and I believe we will keep making small adjustments as we go.

FIGURE 10 KAZI SUMON. IMAGE PROVIDED BY K. SUMON

## **PURE Award**

Students identifying as members of equity-deserving groups experience barriers to persistence in research opportunities in higher education. In 2021, we created the <u>Equity</u>, <u>Diversity</u>, <u>and Inclusion (EDI) Action Plan</u> to address the accessibility of undergraduate research. The EDI Action Plan concluded with 23 recommendations for improving the accessibility of the PURE Award and undergraduate research broadly. To date, we have completed 14 out of 23 recommendations in the EDI Action Plan. See Table 6.

## TABLE 6 EDI PLAN RECOMMENDATIONS ENACTED TO DATE

## Recommendation

### **Inclusive messaging**

- 1. Change the name of PURE
- 2. Develop an EDI Statement and an Indigenous Statement for PURE
- ✓ 3. Incorporate EDI-focused learning goals into the PURE learning outcomes

## Gathering a diverse group of applicants

- 4. Open PURE to part-time students
  - 5. Create part-time PURE Awards
- 6. Lower or remove GPA threshold
- Incorporate Universal Design for Learning (UDL) principles into the application process
  - 8. Allow students to apply for collaborative PURE Awards
- 9. Offer targeted recruitment sessions
- I0. Encourage students seeking a research supervisor to consider the supervisor's mentorship practices and research environment
  - 11. Include a Land Acknowledgement and relationship to the land for the proposed research
- $\checkmark$  12. Ask students to outline research milestones or objectives for proposed research
- ✓ 13. Ask supervisors to include a statement on how they will create an inclusive research environment
- ✓ 14. Allow students an opportunity on the application to provide further information

## Selection methods

- 15. Support reviewers and coordinators in the adjudication process to ensure selection processes consider Indigenous principles and EDI principles
- ✓ 16. Develop a set of targets linked to the disciplinary diversity of the entire campus
- ✓ 17. Implement EDI-targeted awards

### Inclusive programming

- 18. Develop and support a peer-mentorship network focused on undergraduate research
- 19. Develop an EDI-focused workshop for students
- ✓ 20. Support supervisors in developing an inclusive and safe research environment for students
- ✓ 21. Incorporate Universal Design for Learning (UDL) principles into PURE programming

### Collection and use of demographic data

- ✓ 22. Modify the EDI demographic questions in the application form
- ✓ 23. Report on EDI demographics

In consultation with cross-campus EDI experts and review of existing EDI initiatives, including the <u>Equity, Diversity and</u> <u>Inclusion in the Research and Teaching Awards</u> and the <u>Equitable Pathways to Experiential Learning Project</u>, we continue to build our knowledge of how equity-deserving students experience barriers to research opportunities, and of how we can increase access and equity in our programs.

# **Ready for Research**

The Ready for Research Badge was launched in October 2022. The program intends to introduce undergraduate research to as many and as diverse students as possible. Throughout the years, we have heard strong interest from students for undergraduate research opportunities. We have recognized that the number of opportunities can be limited and inaccessible to equity-deserving groups and first- and second-year students. After months of consultation and curriculum design and informed by the 2020 National Survey of Student Engagement findings, the program launched with 700+ students enrolled at the start of the Fall 2022 semester. See Table 7 for student enrollment in Ready for Research by faculty.

## TABLE 7 READY FOR RESEARCH: ENROLLMENT BY FACULTY

Faculty	# Students Enrolled at start of Fall 2022
Faculty of Arts	144
Cumming School of Medicine	63
School of Architecture, Planning and Landscape	-
Haskayne School of Business	22
Faculty of Kinesiology	46
Faculty of Law	1
Faculty of Nursing	11
Faculty of Nursing (Qatar)	1
Schulich School of Engineering	108
Faculty of Science	265
Faculty of Social Work	4
Faculty of Veterinary Medicine	1
Werklund School of Education	9
Open Studies	21
Continuing Education	7

# **UNIV 302: Research on Global Challenges**

In 2022, we hired Saskia-Mae Livingstone to identify, evaluate, and recommend modifications to our work that aligned with the University of Calgary's ii' taa'poh'to'p, Indigenous Strategy and the Office of Equity, Diversity, and Inclusion's mission. This work grew from the foundational research of the EDI Action Plan that revealed that undergraduate research engagement was low with Indigenous students. We also heard feedback from the campus community regarding the need to connect the Experiential Learning Plan to ii' taa'poh'to'p.

### Saskia-Mae Livingstone, Indigenous Engagement (PURE Award and Undergraduate Research) Research Assistant

I recently graduated with a Bachelor of Arts in Law and Society, and currently work at the TI. The path to where I am today was completely unexpected. There was a period where I felt that I didn't have a lot going for me. I decided to open myself to new possibilities and say yes to whatever opportunities came my way, even if they were out of my comfort zone. I'm so glad I did. In third year, I received a PURE Award, which prompted me to be a Research Coach in UNIV 302. After that, my supervisor and I wrote a MITACs grant and I presented at the UCalgary Conference on Postsecondary Learning and Teaching, where Dr. Flanagan approached me about the role I am in now. I am working on a research project exploring how we can expand undergraduate research opportunities to better reach Indigenous students at UCalgary. This work is like nothing else I have done before. I get to share my experiences as a Métis student and those of other Indigenous students and bring it all together into one big report with recommendations - and we are already seeing these recommendations enacted!



FIGURE 11 SASKIA-MAE LIVINGSTONE. IMAGE PROVIDED BY S. LIVINGSTONE

Saskia's work is captured in the <u>Increasing Indigenous Engagement in Undergraduate Research Initiatives</u> report. This report explores intersections between the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), the Truth and Reconciliation Calls to Action (TRC-CTA), ii' taa'poh'to'p strategy, and the *Experiential Learning Plan*. The report includes 15 actionable recommendations of ways the URI can expand high-quality undergraduate and increase the accessibility of its programming for Indigenous students. These recommendations are categorized according to the themes described in ii' taa'poh'to'p, including Ways of Knowing, Ways of Doing, Ways of Connecting, and Ways of Being. See Appendix E for a summary of recommendations. They resulted from an extensive consultation process with Indigenous undergraduate students, Indigenous-focused campus groups, staff at the CDCI, and core values of Indigenous ways of knowing. See Figure 12. While the report came from Saskia's work as a Research Coach in UNIV 302 and primarily focuses on the PURE Award, the recommendations can be integrated throughout the URI's other programs.



## FIGURE 12 INCREASING INDIGENOUS STUDENT ENGAGEMENT: METHODOLOGY

This work's impact is already being seen, including changing the GPA requirements for many summer studentship programs and allowing part-time students to apply for the PURE Award. Relationship building with Indigenous-focused campus groups led to four information sessions on undergraduate research and the PURE Award to ISAP students and students in the Fall 2022 Indigenous Studies (INDG) 201 and 399 courses.

# **Building Networks and Sharing Knowledge**

In this strategic area, we focus on building connections with faculty members and units across campus and sharing our research, experiences, and reflections with the campus and scholarly community.

In 2021-22, CDCI Academic Lead, Dr. Kyla Flanagan, has presented and facilitated several conference presentations and workshops focused on undergraduate research:

- Equity, Diversity, and Inclusion in Undergraduate Research. Taylor Institute, Experiential Learning Workshop Series. Copresenter: Austin Ashbaugh (Nov 2021)
- CURE Conversations: Implementing CUREs. Invited speaker: Panel hosted by the Council on Undergraduate Research (Sept 2021)
- Data and Project Management for Undergraduate Research. Invited workshop: Department of Biological Sciences. Copresenter: Heather Ganshorn (Sept 2021)
- Getting Started with a Question using the Question Formulation Technique in Biology. Undergraduate Biology Educators of Alberta Conference. Co-presenter: Dr. Mindi Summers (May 2022)
- Developing Equity, Diversity, and Inclusion Statements. Invited workshop: Bamfield Marine Sciences staff meeting. Copresenter: Austin Ashbaugh (Jan 2022)

## CURE

Kara Loy (Educational Development Consultant: Experiential Learning & Undergraduate Research) supported CURE instructors and research coaches. Throughout 2021-22, Kara shared her insights on promoting undergraduate research via publications and conference presentations.

- Loy, K., Tiala, S., & Massie, M., (2021, November 27-Dec 2). Strategies and Solutions using the Research Skill Development Framework to promote campus-wide research-oriented teaching and cultural shifts. Australian Association for Research in Education (AARE), Reimagining Education Research: Brisbane, Australia (virtual). Conference presentation accepted as part of an international symposium.
- Loy, K. (2022, April 5-6). Keynote Presentations (x2). The future is sensational the future is interdisciplinary. Research & Innovation Week: Undergraduate Research Day; International Symposium of Undergraduate Research Excellence (I-SURE) (virtual). Prairie View A&M University, Texas, USA.
- Loy, K. Tiala, S., & Massie, M., (2022, June 23). Impacts and Campus Community Building: three strategies for promoting campus-wide undergraduate research with faculty and students. ConnectUR conference.

## **PURE Award Faculty Coordinators**

PURE Award Faculty Coordinators support the PURE Awards program by coordinating the adjudication process for their faculty, supporting students and supervisors within their unit, and supporting some program communications. Their leadership within their faculties ensures the successful identification of each year's PURE cohort and student and supervisor

success. Other responsibilities include but are not limited to answering and redirecting student and supervisor questions to the PURE Award Team, leading the selection, assignment, and coordination of adjudicators in their faculty, ensuring adjudicator's scores are entered into the Consolidated Application System by the deadline, and coordinating and facilitating adjudication meetings, if applicable. After adjudication is complete, they rank and send the results to the PURE Award Team.

## Dr. Cynthia Prasow, PURE Award Coordinator, Werklund School of Education

As the PURE Award Coordinator and the chair of the scholarship committee for Undergraduate Programs in Werklund, I have had the honour of working with a diverse group of people including students, faculty, and support staff that contribute to making the PURE Award a meaningful experience. When the PURE Award first entered the scene, it naturally fell within my role and I have seen the program evolve, respond, and improve the process to better serve our students. Werklund has also developed an Undergraduate Research Award in Education that mirrors the PURE Award. Students apply for both awards at once, and after PURE Award adjudication is completed, students who applied but didn't get it are immediately in the running for our award. This opens undergraduate research a little more and provides students learning opportunities they wouldn't otherwise have. This is what it's all about. The possibilities are endless in terms of what students can accomplish and how they can impact others. Last year, a student took their PURE Award research into their student teaching out in their school placement. What a benefit it was for the students in that school. This student also had an opportunity to present his research at a teachers' conference. It was the best possible outcome you could imagine!



FIGURE 13 CYNTHIA PRASOW AND CHARLENE LAUZIER. IMAGE PROVIDED BY C. PRASOW

# **UNIV 302: Research on Global Challenges**

Several UNIV 302 research stream supervisors, students and the instructional team went on to publish and present their findings and experiences to the broader academic community.

- Bowyer, RJ., Riedlinger, M.D., <u>Servinski</u>, S.j., Bader, A., & Tutolo, B.M. (2021) An attempt at comparatively ranking Negative Emission Techniques for Canadian deployment. GeoConvention 2021.
- Kincaid, A.T., Brulotte, M., Livingstone, S., & Brar, J. (2021). <u>Ways of doing, knowing, connecting and being</u>. Canadian Philanthropic Partnership Research Network. (2021)
- Kincaid, A.T., Livingstone, S., Li, G., Adeladan, H., Obiar, N., Kumar, S., Tirmizi, S., Anderson, M., & Hunt, I. (2022). <u>Towards reconciliation: Philanthropy, animal-human relationships, and community engaged learning</u>. Canadian Philanthropic Partnership Research Network.
- Obiar, N.M. & Urrutia, R.M. (2022). <u>Educational Reconciliation: Implementing Traditional Land-Based Learning in</u> <u>Canadian Universities</u>. *Canadian Journal of Undergraduate Research* 7(2).

# **Developing Resources and Faculty-Development Programs**

In this strategic area, we develop undergraduate research experience learning resources and programs, including open-access research videos, faculty guides, communities of practice, workshops, and micro-credentials.

In 2022, members of the URI Team collaborated with Drs. Ariane Cantin and Mindi Summers, both instructors in the Faculty of Science and regular CURE instructors and PURE Award supervisors, in writing <u>A Guide to Undergraduate Research at</u> <u>UCalgary (2022)</u>. The intended audience for this guide is instructors designing curricular undergraduate research experiences or research mentors supporting undergraduate research experiences in an apprenticeship model. This guide was written with an awareness of the disciplinary differences in research and student diversity while providing guidance and direction for the research process. Graduate Teaching Assistants or Research Coaches supporting undergraduate research will also find value in this guide. Finally, undergraduate students undertaking a research project may also find this guide beneficial in understanding the research process.



FIGURE 14 A GUIDE TO UNDERGRADUATE RESEARCH AT UCALGARY (2022).

## CURE

Over 2021-22, Kara Loy collaborated with graduate student Joy Camarao and librarians, including Dr. Alix Hayden (Librarian, Libraries & Cultural Services) to create a LibGuide for undergraduate research: <u>https://libguides.ucalgary.ca/guides/CUREs</u> The LibGuide has two key sections:





## **Student Resource Guide**

This guide includes resources to support students in the research process including:

- narrowing down the research topic,
- writing a research question
- completing a literature review
- managing citations,
- sharing completed work

## Instructor Resource Guide

This guide includes resources for instructors to learn more about the value of and how undergraduate research experiences can be integrated into new and existing courses. Content includes:

- Readings/resources
- CURE Guide: Design, Mentorship, Concerns, Dissemination, Assessment, References
- Best practices

In addition, Kara Loy published a chapter in the *Cambridge Handbook of Undergraduate Research* (2022): Loy, K. (2022). Undergraduate Research in Canada: Growing a Culture of Research for Undergraduate Education. In H. Mieg, E. Ambos, A. Brew, D. Galli, & J. Lehmann (Eds.), The Cambridge Handbook of Undergraduate Research (Cambridge Handbooks in Education, pp. 456-463). Cambridge: Cambridge University Press. doi:10.1017/9781108869508.064

## **CURE Research Coaches**

Research Coaches are recruited by CURE instructors as the class size, CURE scope, and budget allow. The research coaches participate in a training session at the start term to learn about the role and to upskill in facilitation and research mentorship. This training is complemented by a mid-term and year-end check-in via email, Qualtrics surveys, or focus groups.

## Thiago Monteiro, Research Coach, ECOL 313: Principles of Ecology

I'm a Masters' student in Ecology and my research is focused on little brown bat reproductive timings. I was a Research Coach in ECOL 313 with Dr. Ariane Cantin. That course is typically students' first taste of research, so it's quite important. My role varied throughout the semester. In the beginning, I made documents, rubrics, and resources. Then, when students were working on their group projects, I coached them through writing research questions, defining scope, and navigating the unexpected. At the end of the semester, students had to present their findings via a poster. I supported them in visualizing their research and condensing data. Throughout this experience, I reaffirmed that all students start from different places. Their needs, experiences, and expectations are unique. It was exciting for me to tailor my teaching to students' needs. Even if they didn't want to be a scientist or to do research, it was possible for them to get a basic understanding about scientific research out of the course – and this is essential, especially post-pandemic. One student, she wasn't very interested in research but had an amazing talent for drawing. For her poster, she created hand-drawn bears and salmon and integrated them throughout her findings. It was beautiful.



FIGURE 15 THIAGO MONTEIRO. IMAGE PROVIDED BY T. MONTEIRO

## **Designing a CURE Badge Program**

The Designing a CURE Badge provides instructors with proven strategies, resources, exemplars, and critical friendships in designing a CURE. Participants proceed toward (re)envisioning class or lab-based activities as an independent or collaborative research project for students. Participants begin by engaging in undergraduate research as an experiential learning approach and building a course-based community of researchers in online or in-person contexts. Participants have opportunities to compare and critique existing CURE activities, descriptions, and assessment protocols to inform the development of their own original and captivating CUREs in the courses they deliver.



FIGURE 16 CURE BADGE

The CURE Badge's pilot had 24 participants, primarily faculty and postdoctoral scholars. Of these, seven participants participated fulsomely in the micro-credential, with an expected three new CUREs to be offered in the faculties of Arts and Kinesiology over the next academic year. At the end of each session, participants were prompted to complete the workshop evaluation survey. Participants regularly described appreciation for the diversity of resources and examples of CUREs across faculties provided. A few participants also considered whether a badge program was sufficient preparation to implement a CURE in a course. In the words of one participant: "I'd take this course as an introduction, an effective way to start thinking about how I can design a CURE. [Afterwards], I imagine a few one-on-one sessions where I can discuss my roadblocks in the design of my CURE with the instructors would be helpful". Other participants shared that they were excited by the diverse resources the program shared with them. When asked, "what was the most valuable thing you learned in this course," one respondent replied:

"Probably can't pick just one. I had little to no knowledge about how to design any course coming into this, so I appreciated everything. Notably, the availability of resources from the Taylor Institute to support the design, development & implementation of our courses. The most valuable takeaways for me came through the little details, e.g. differences between summative and formative feedback, incorporating student choice in projects, different prompts to use to help with evaluations/reflections, etc." (CURE Badge Participant)

# **Engaging with Community Partners**

In this strategic area, we seek to nurture opportunities for community-integrated undergraduate research, maximize undergraduate research impact on local, national, and international communities, and support others engaging in research with community partners.

## CURE

In 2022, five courses with CUREs featured community partners or engaged with community members or publicly available data to deepen the research relevance and experience for students. These courses were INDG 415 and INDG 502, BIOL 313, ZOOL 435, and SPAN 508.

In INDG 415 and 502, Dr. Adela Kincaid forged a new partnership with the Office of Sustainability. She built upon previous partnerships with the Alberta Institute for Wildlife Conservation formed as part of UNIV 401 and UNIV 302. In 2022, Dr. Kincaid, Saskia-Mae Livingstone, and the Alberta Institute for Wildlife Conservation applied for and received a MITACS grant that would provide \$60,000 to support four undergraduate research positions with the Alberta Institute for Wildlife Conservation. Preference for these positions will be given to Indigenous students.

In SPAN 508, Dr. Angela George invited students to apply linguistics principles to analyzing community members' interactions in heritage languages and dialects. Willing community members were identified through personal connections and community-based agencies.

In BIOL 313 and ZOOL 435, Dr. Ariane Cantin and Dr. Mindi Summers, in collaboration with Dr. Ogonna Nwankwo, continued their research-based partnerships in having students collect, collate, or analyze data provided by Katmai US National Park Service in Alaska, Cornell Laboratory of Ornithology & Birds Canada, CourseSource, Audubon Christmas Bird Count, iNaturalist, and the City of Calgary.

## Travis Milnes, Office of Sustainability, Campus Partner with INDG 502 and 425

The Office of Sustainability's <u>Campus as a Learning Lab</u> (CLL) initiative is creating opportunities for instructors to develop partnerships which open pathways for students to apply their disciplinary knowledge to advance sustainability on campus. Previously, students have created anything from artwork and communications pieces to business and engineering projects. A partnership with instructors from Indigenous Studies 415 and 502 courses is enabling learning opportunities for UCalgary community members to understand ways sustainability can be decolonized through a two-eyed seeing approach that reflects on both settler and Indigenous perspectives. Students examined ways to amplify Indigenous perspectives in sustainability, identified a network of clubs and student-supporting offices to explore the equitable representation of voices in sustainability from settlers and Indigenous Peoples, and proposed the creation of a capstone course for the Certificate in Sustainability Studies where students can connect their learnings to Indigenous sustainability perspectives. Students are informing campus sustainability practices through CLL by championing sustainability as we learn and work together.



FIGURE 17 TRAVIS MILNES. IMAGE PROVIDED BY T. MILNES

## **PURE Award**

In the PURE Award student exit survey, we asked respondents whether their research included community partners. Respondents can select from a list of <u>UCalgary community partners</u> or fill in their partner's name. See Table 8.

## TABLE 8 PURE AWARD 2021-22 COMMUNITY PARTNERS

Community Partner	2021 Survey Respondents	2022 Survey Respondents
Alberta Health Services	1	1
Calgary Public Library	2	-
City of Calgary	3	2
Other: Please state.	4	3
Total	10	6

In 2021, the other community partners listed were the Transforming the Field Education Landscape (TFEL) Project, Mindfuel, the iGEM Foundation, Genome Alberta, Stoney Nakoda and Tsuut'ina communities. In 2022, other community partners listed were Parks Canada, Alberta Environment and Protected Areas, and the Canadian Oil Sands Innovation Alliance.

# **Research on Global Challenges: UNIV 302**

Two UNIV 304 Streams engaged with community partners:



Humans, Animals, and the Environment

Dr. Adela Kincaid



Indigenous Experiences with Police Dr. Adam Murry

## Community Partner: Alberta Institute for Wildlife Conservation

Understanding animal-human interactions can make important contributions to sustainability. Blended and transdisciplinary research approaches to animalhuman studies should include Indigenous worldviews as they offer a vital and often missing piece to research on human-animal studies (HAS). HAS is crucial to understanding our complicated relationship with animals, spanning important socio-cultural topics, including health, animal and human well-being, consumption, domestication, agriculture, animal ethics, sustainability, and wildlife conservation. By providing critical and holistic perspectives on humanwildlife interactions, Indigenous Studies provide a framework for decolonizing animal roles and positioning animals as equitable partners.

## Community Partner: Portland Committee on Community-Engaged Policing

Indigenous Peoples have a complex history with the criminal justice systems of colonial settler states like Canada and the United States. Similar to their counterparts in the African-American/Black community, North America Indigenous Peoples are stopped, arrested, convicted, and detained more often and for longer times than non-Indigenous citizens, per their percentage of the population... This applied research project is a collaboration with the Portland Committee on Community-Engaged Policing. The goal is to inform the development of community-based assessment tools about Indigenous experiences with the police, law enforcement, and the criminal justice system.

# **Communicating Impact**

Finally, in this strategic area, we evaluate and communicate the value and impact of undergraduate research across programs and activities and recognize and celebrate faculty and student achievements and collaborations with industry, community, and other external partners.

## CURE

CURE instructors are innovative and driven. They take up leadership positions and earn recognition through awards for teaching and research. In 2021-22, many CURE instructors were honoured with awards and recognition. See Table 9.

Year	Instructor	Instructor Faculty	Award & Recognition
2021	Dr. Mindi Summers	Science	Elected as division councillor for General Council for the Council of Undergraduate Research, Biology Division
2022	Dr. Ariane Cantin	Science	Research Excellence Award (Early Career) Biological Sciences, Faculty Awards of Excellence
	Dr. Eleanora Buonocore	Arts	Students' Union Teaching Excellence Award
	Dr. Maria Victoria Guglietti	Arts	Established Teacher, Teaching Award, Faculty of Arts
	Dr. Mindi Summers	Science	Killam Undergraduate Mentorship Award

## TABLE 9 CURE INSTRUCTOR AWARDS AND RECOGNITION

In addition, several students, including research coaches and faculty, published on their CURE experience: Boettcher, A., Springer, M., Gunnels, B., Jackson-Hardwick, D., Mendoza, S., Strauss-Soukup, J. & Loy, K. (2022, June 21) Initiating and Sustaining Undergraduate Research, Scholarship, and Creative Inquiry (URSCI) programs. ConnectUR Pre-Conference workshop.

Lastly, in 2021-22, CURE instructors and courses were featured in three UToday stories:

- April 5, 2022: "How to build community engagement and partnerships into student learning opportunities."
- April 19, 2022: "<u>All abuzz about bees at University of Calgary 'Bee Campus'</u>"
- May 15, 2022: "<u>Course revamp is a hit with kinesiology students when they create their own fitness tests</u>." This story
  was publicized, with permission, to the Council on Undergraduate Research community through their <u>main page</u> and
  social media accounts.

## **PURE Award**

The URI hosts the Celebration of Achievement at the end of each PURE Award cohort. This event is an opportunity to commend the work of PURE Award supervisors and students alike. The 2021 Celebration was hosted remotely, and the 2022 Celebration was hosted in person, followed by a digital expo featuring PURE Award recipients showcasing their research. Both events featured presentations by the Provost, Vice-President (Research), and Vice-Provost (Teaching and Learning).

In reflecting on previous evaluation research, we wanted to learn more about the stories connected to PURE Award student outcomes. In 2022, we collected 21 mini stories of PURE Award recipients from seven faculties in the 2021 and 2022 PURE Award cohorts. Each interview had guiding questions to facilitate conversation, but students could discuss whatever they wished. See Figure 18 for a sampling of student mini-story quotes.

### FIGURE 18 PURE AWARD 2021-22 MINI STORY QUOTES

## **Bonnie Piercey (Arts)**

"... My supervisor said something which has stuck with me... those 'gaps' and 'walls' which a researcher encounters, are not stopping places – they're starting places. They are questions which no one has asked yet, so maybe I can be the one to ask them."



#### Harsimrit Lakhyan (Nursing)

"... My supervisor was quick to say that we were working as peers and colleagues... This approach energized me, as my contributions were just as important as hers. She's also an ICU nurse, so I got to explore a new branch of nursing."



## Joy Idowu (Science)

"My supervisor and her graduate students taught me a lot about what she does and how different reactions occur. [Afterwards], I applied for the Science Internship Program to help me decide whether I wanted to pursue a career in industry or research."



### Rakshit N.D. Baskar (Science)

"... I got to conduct my first real science experiment. It was a true research process because we didn't know what would happen and this 'waiting in expectation' is a part of the scientific way. Happily, we got the results we expected, encouraging us to continue."



#### Simon Hus (Schulich)

"...The connections between the theoretical and the technical are more present than one may think. In a course, experiments are designed to give a certain result, so you learn a specific thing. In research, you'll know the goal, but you won't know the path – it's up to you to figure that out."



## **Douglas Li (Science)**

"... It taught me that I need to be humble and always look for ways I can improve. Humility also applies to the research process. Not everything is ideal. When something goes wrong, being humble will allow you to think critically about how to figure things out."



## Jason Valleau, (Werklund)

"I researched Indigenous music and created lesson plans for Alberta schools... I struggled with navigating appropriation versus appreciation... After PURE, I got to apply research theory to practice in my teaching practicum at a Cree school."



## Madeline MacLean (Arts)

"...I attended regular meetings that my supervisor set up with me and her graduate students. Each week, we'd talk about our experiences, road bumps, and what articles we are reading. For me, these meetings solidified the importance of community in research."



## Sharmaine Tay (Werklund)

"... There was an unexpected hiccup early on, and I was at a crossroads... [I realized] that my research identity needs to be flexible. I won't always know where I am at, and though the unexpected may happen, there are still ways to honor the ideas and values I entered the research with."



#### Sofia Celis (Medicine)

"... In PURE, I had to set my own deadlines and goals, and discipline myself to achieve them. I finished PURE with a sense of confidence that I didn't anticipate. It's also been rewarding to uplift the voices of long-term care workers and advocate for social change through research."



See Table 9 for a list of mini-story features. Copies of all mini-stories are featured in Appendix F, and can be found online at <a href="https://pure.ucalgaryblogs.ca/mini-stories/">https://pure.ucalgaryblogs.ca/mini-stories/</a>

TABLE 10 2021-2022 ST	<b>FUDENT MINI</b>	<b>STORY FEATURES</b>
-----------------------	--------------------	-----------------------

Cohort	Faculty	Name	Project Title
2021	Schulich	A.D. Mohammad	M.E.D.A.L Lab
	Science	Joy Idowu	Halogen bonding in diaryliodonium salts
		Max Brant	"KAPS" lock – A bold investigation of the role of KAP1 in mammary gland development
	Werklund	Jason Valleau	To create a lesson plan that celebrates a collaboration with Stoney Nakoda and Tsuut'ina Nation drumming and singing while realizing limitations and the imposition of Eurocentric music theory systems
2022	Arts	Andrea Silva Santisteban Fort	Indigenous and Environmental Movements and their effect on political discourse on the extractive industry of Ecuador, Peru, and Bolivia
		Bonnie Piercey	Digital Restoration of Decorations in Pompeii's 'House of the Golden
		Dorothy Chacinski	Detecting Signs of Brain Atrophy as an Early Biomarker of Dementia in Individuals with History of Transient Ischemic Attack
		Justine Bui	Combatting Colourism in Asian Communities
		Madeline MacLean	Linguistic Melody and Context in Language Comprehension
		Nicole Ferguson	Variation of Formal Pronouns in the World's Languages
	Kinesiology	Bilal Rizvi	The Relationship Between Mental Health Symptoms and Disability in Children and Adolescents with Migraine: An Observational Study
	Medicine	Batool AlMousawi	Mental health and Well-Being among Mothers during COVID-19: A Mixed Methods Approach
		Noelle Thundathil	Investigating genetic differences between three human hookworm populations with differing sensitivity to benzimidazole drug treatment
		Sofia Celis	Supporting mental health and preventing moral distress among long-term care workers
	Nursing	Harsimrit Lakhyan	Scoping Review of the Use of Virtual Simulation for Continued Professional Development in Critical Care Nurses
		Nadia Bibi	Perspectives on Sustaining Vulnerability Within the Context of a Global Pandemic: A Qualitative Study
	Schulich	Simon Hus	Measurement Device Independent Quantum Key Distribution (MDI-QKD)
	Science	Austin Shawaga	The Android Activity Log and the Discernability of Private Information
		Douglas Li	Impacts of vaping additives on model lung surfactant films
		Rakshit Narayanan Devaraj Baskar	Evaluation of the carbon cycle systematics of AVECS – A biomass-based technology for large scale carbon dioxide removal
	Werklund	Sharmaine Tay	Lived Experience in Small Groups During COVID-19: An Autobiographical Study

In 2021-22, many PURE Award students and supervisors were also featured in multiple UToday stories:

- August 23, 2021: "Once upon a time in Forest Lawn"
- November 15, 2021: "Survey says: When it comes to anti-racism, we reflect more than we act"
- November 15, 2021: "PURE award recipient explores how LGBTQ2S+ youth are faring during the pandemic"
- November 22, 2022: "Undergraduate awards provide experience beyond the classroom"
- December 14, 2022: "PURE Awards spark enthusiasm for research in students and supervisors"

## **UNIV 302: Research on Global Challenges**

In 2021, Dr. Kyla Flanagan and UNIV 302 Research Stream Supervisor, Dr. Adam Murry, received prestigious Killam awards associated with their UNIV work:

- October 21, 2021: "Dr. Kyla Flanagan's teaching excellence honoured with McCaig-Killam Teaching Award"
- October 27, 2021: "Dr. Adam Murry asks undergrads: What are you hoping to accomplish in the real world?"

In 2021, Dr. Flanagan was also awarded the Faculty of Science Educational Leadership Award and nominated for the 3M National Teaching Fellowship.

In addition, Dr. Victoria Fast also received the UCalgary Teaching and Learning Award for experiential learning initiatives

## Ginny Li. UNIV 302. Faculty of Science

Towards the end of my undergraduate degree in Biological Sciences, I was keen to be involved in lab research, but the pandemic didn't allow for in-person research to happen. That's when I discovered UNIV 302. Dr. Adela Kincaid's stream, "Animals, Humans, and the Environment", provided an excellent opportunity to blend science, Indigenous studies, and research into one experience. We partnered with the Alberta Institute for Wildlife Conservation to research Indigenous pedagogies for their animal educational programs, and to apply the principles of ii' taa'poh'to'p to our literature review. I enjoyed UNIV 302 because there were likely going to be real-world effects from my work. For example, the 50-page literature review I generated would be read by the educational director at the organization and hopefully, make a positive impact for young students interested in animal conservation. The research also affirmed my knowledge and values. I come from the northeast of Calgary, and it is a diverse place. I've had the opportunity to come across so many different perspectives and apply those experiences to this course. In UNIV 302, relationships with organizational partners always came first, I had indispensable guidance from students and people outside of UNIV 302 that I would not have received otherwise; this learning will stay with me in my next chapter.



FIGURE 19 GINNI LI. IMAGE PROVIDED BY G. LI

# What's Next

This year, we will continue to deliver undergraduate research experiences through courses with CUREs, the PURE Award, and the Ready for Research Badge. We also seek to renew the Research on Global Challenges model and extend funding for the PURE Award by seeking funding from other sources.

For 2023 and beyond, we will continue the strong focus on commitments to reducing barriers and increasing access to undergraduate research. This year, the 2023 PURE Award summer workshop series and micro-credential will be open to NSERC Undergraduate Student Research Award (USRA), NSERC USRA-Black student awardees, and Alberta Innovates summer students. We are partnering with the Office of Equity, Diversity, and Inclusion (OEDI) and VP-Research offices to deliver this series. Team members will co-deliver the supervisor orientation and student workshops. We will develop a "toolkit" for mentoring and supervising racialized and Black students in undergraduate research. We will also provide guidelines to students and supervisors on best practices based on lived experience to establish clear guidelines and a code of conduct on EDI in labs and research teams.

Additionally, the OEDI and PURE Award teams will develop training sessions on foundations for EDI, mentorship, and supervision to provide holistic support for Black and racialized students. We will use and enact the 15 recommendations in the Increasing Student Engagement in Undergraduate Research Initiatives report regarding Indigenous engagement with undergraduate research. We will also continue with recruitment sessions with the Indigenous Student Access Program.

Our work to develop resources and create faculty development opportunities will consist of new online modules focusing on EL and undergraduate research specifically. We will re-consider and re-evaluate our faculty support model for undergraduate research. To continue amplifying our community engagement, we will explore creating a fund for community-engaged research, particularly in support of CUREs looking to create partnerships with the community. We will also continue our commitment to storytelling, reporting, evaluation, and sharing the story of UR at UCalgary. In the future, we hope to share this work and the unique experiences of students, instructors, research coaches, and community partners engaging in undergraduate research with the Calgary community and beyond.

For more information, contact:

Dr. Kyla Flanagan Academic Lead, College of Discovery, Creativity, and Innovation Office of Experiential Learning, Taylor Institute for Teaching and Learning 403-220-7644 | <u>kmflanag@ucalgary.ca</u>

# **Appendix A: CURE Program Outcomes**

CURE outcomes fall across three participant groups: students, course instructors, and research coaches:

Participants	Outcomes
Students	<ul> <li>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</li> <li>Collaborate with other researchers to apply disciplinary approaches in designing, planning, and implementing a research project</li> <li>Describe the importance of research to communities on- and off-campus; effectively communicate the value and impact of research and conclusions to various audiences</li> <li>Reflect on and articulate the impact of the research experience on research skill development and researcher identity</li> </ul>
Course Instructors	<ul> <li>Design and integrate course activities to focus student learning on knowledge production</li> <li>Facilitate students moving through the challenges and opportunities of term-based research</li> <li>Participate in a collaborative practice of teaching with innovative, evidence-based pedagogies</li> <li>Generate contributions to the scholarship of teaching and learning / educational research</li> </ul>
Research Coaches	<ul> <li>Develop professional and academic skills in facilitating learning and mentoring research</li> <li>Collaborate on the delivery of innovative, research-focused pedagogy</li> <li>Advance a scholarly and practical understanding of teaching and learning approaches/techniques</li> </ul>

# **Appendix B: PURE Award Outcomes**

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

# **Appendix C: Ready for Research Outcomes**

Outcome	Domains
Describe the undergraduate research context at UCalgary, demonstrating an awareness of undergraduate research opportunities and strategies for engaging in undergraduate research	cognitive domain – comprehend & affective domain - value
Demonstrate an appreciation and respect for the diverse ways of knowing and doing research and respect the variety of beliefs and motivations that go into research practices	affective domain – value
Describe and practice research ethically and with integrity, adhering to UCalgary's Research Integrity Policy and Code of Conduct	cognitive domain – comprehend & affective domain – internalize values
Develop a reflective research practice, articulating the skills developed through research experiences	affective domain – conceptualize values
Develop an identity as a researcher, displaying confidence to engage in undergraduate research	affective domain – conceptualize and internalize values
Formulate a research journey plan to demonstrate a commitment to engage in undergraduate research	cognitive domain – create & affective domain – internalize values

# **Appendix D: Research on Global Challenges**

Component	Learning Outcomes By the end of the course, students will be able to
Research Foundations	<ul> <li>Develop 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</li> <li>Demonstrate an awareness of and adherence to the safety and ethical research practices of the discipline</li> <li>Demonstrate an understanding of the research process, diverse research methodologies, and the interpretation and critical analysis of data &amp; information</li> <li>Search the literature to find needed information, <i>evaluate</i> the credibility of sources and information, <i>organize</i> information to reveal patterns and themes, and <i>analyze</i> information critically to produce a coherent understanding</li> </ul>
Community & Collaboration	<ul> <li>Collaborate with researchers in the design, planning, implementation, and dissemination of a research project</li> <li>Demonstrate the five key competencies identified as critical to team effectiveness (commitment, communication, knowledge, uphold high standards &amp; focus) during work with team members</li> </ul>
Reflection & Skills Articulation	<ul> <li>Reflect on and articulate the impact of UNIV 302 on your personal learning goals, research skill development, and your identity as a researcher</li> </ul>

Research	•	Describe the importance of your research to communities on- and off-campus
Dissemination	•	Effectively communicate the value and impact of your research and conclusions to a variety of
		audiences

# Appendix E: Recommendations in Increasing Indigenous Engagement in Undergraduate Research Initiatives

Theme	Recommendations
Ways of Knowing Teaching, Learning, Research	<ul> <li>Align programming to ii' taa'poh'to'p</li> <li>Ensure staff critically evaluate their knowledge or lack of knowledge and biases about Indigenous peoples and histories in Canada</li> <li>Create an Indigenous research program in collaboration with other units on campus</li> <li>Create supportive learning and research environments for Indigenous students that recognize and reflect Indigenous pedagogies, research methodologies and the concept of shared space</li> </ul>
Ways of Doing Policies, Procedures, Practices	<ul> <li>Hire more Indigenous students to work at campus offices</li> <li>Engage in targeted outreach and recruitment campaigns to increase awareness of experiential learning and undergraduate research opportunities</li> <li>Evaluate and edit application forms</li> <li>Collect accurate data on Indigenous student engagement with programming</li> </ul>
Ways of Connecting Relationships Partnerships, Connection to Land, and Place	<ul> <li>Ensure staff understand the land and traditional territories on which UCalgary is located</li> <li>Support community-based research</li> <li>Ensure cross-campus relationships are respectful, reciprocal, and sustainable</li> <li>Ensure faculty supervisors are equipped to support Indigenous students</li> </ul>
Ways of Being Campus Identity, Inclusivity, Leadership, Engagement	<ul> <li>Visibly Indigenize CDCI/OEL campus spaces</li> <li>Increase Indigenous student representation in programming</li> <li>Increase the funding for students engaging in summer studentships</li> </ul>

# **Appendix F: PURE Award Mini-Stories**

## 2021

## A.D. Mohammad, Schulich School of Engineering

"I am a Bachelor of Science student in Mechanical Engineering. I received my PURE Award in 2021, where I researched hydrogen and natural gas blending. This was part of a bigger research project for ATCO Gas. We (another graduate student and I) were particularly interested if stratification would occur with a hydrogen-natural gas blend. When you put two gases in a pipe, if you let them sit long enough, they'll potentially separate. This can be extremely dangerous as the smelling agents in natural gas will leak at different rates, which means you might not detect a gas leak. If this happened in your house, it could combust. The stakes were high! It was so much work and so many hours, but I learned a lot that summer. There was one moment when the research nature of this experience clicked for me. The system could not hold pressure, and there was nowhere we could look up the solution for our particular gas blend. No one had done this before, and it was a high-pressure environment with many deliverables. We realized that it was up to us to figure it out. At that moment, I felt like I was doing real research. The problem took over two months to solve. By the end of the summer, we had a working facility, and completed all the required testing. It was a rollercoaster, but I would do it all over again."



## Jason Valleau, Werklund School of Education

"I've done music my whole life. After completing my Bachelor of Music in 1996, I intended to pursue my Bachelor of Education, but ended up pursuing a career in jazz. Over two-and-a-half decades, my wife and I toured all over the world, founded the Mountain View Music Festival, and collaborated with Desi Rider, the main powwow composer and drummer at the Calgary Stampede. Desi has really opened my eyes to the complex forms, shapes, and melodies in Indigenous music. When my wife decided to go back to school, I decided to finally pursue my Bachelor of Education. I received my PURE Award in 2021, where I researched Indigenous music and created lessons plans for Alberta schools. Throughout, I struggled with navigating appropriation versus appreciation. I've travelled all over the world and played all types of music, but I found it hard to play with musicians close to home. Indigenous music is sacred to Indigenous Peoples. While it's becoming more accessible, today's songs are a part of a thousand years' long musical journey. Realizing this opened my eyes to what truth and reconciliation means to me. After PURE, I got to apply research theory to practice in my teaching practicum at a Cree school. I quickly learned that I needed to establish common ground with Indigenous students - I couldn't just jump into recordings of powwow music. Fostering relationships is so important to building trust and gaining awareness and understanding. We started just by sharing our favourite songs and bands and built a connection slowly and meaningfully. I still get messages from former students in that school who are doing exciting things today. After graduating from Werklund, I took on a new role at Calgary Academy. Considering my learning and experiences, I feel I can offer some insight Indigenous music curricula and connect friends and experiences to the school in an authentic way. Soon, Desi and I are going to collaborate on a fusion album with other local artists, and I hope to bring that work back to the classroom."



### Joy Idowu, Faculty of Science

"I am a Bachelor of Science student, majoring in Chemistry and minoring in Music. I received a PURE Award in 2021. I saw it as a great opportunity to work with my supervisor and to gain research experience. My PURE topic was halogen bonding. I read many papers and took several safety courses before entering the lab. My supervisor and her graduate students taught me a lot about what she does and how different reactions occur. After PURE, I applied for the Science Internship Program to help me decide whether I wanted to pursue a career in industry or research. I was hired as a lab chemist in an industrial cleaning company. In that role, I built upon the knowledge and skills I gained from PURE. One of my tasks was researching alkaline materials on surface properties. I had to read research papers and learn the lab instruments so we could clean a client's equipment without damaging it. There was another time when I was doing an experiment and the theoretical pH and actual pH didn't match. I looked at my calculations and realized that it was because of the activity and properties of the solution. Moments like this helped me discover how good of a chemist I can be when I apply myself. After my internship is complete, I am applying for the honours program and hopefully doing another project with my PURE supervisor."



## Max Brant, Faculty of Science

"I received a PURE Award in 2021 when I was completing my Bachelor of Science in Cellular, Molecular, and Microbial Biology. Today, I am in the Master's in Biotechnology program at the University of Toronto. I wouldn't be in my current graduate program had I not done undergraduate research. For PURE, I investigated how the protein KAP1 influence mammary morphology. Looking back, I appreciate how much I developed my critical thinking and research skills. My supervisor, Dr. Carrie Shemanko, and the Shemanko Lab were critical resources for me. Throughout the summer, I could also be a critical resource for them. Early on, my supervisor applied for a grant to purchase a very high-tech microscope. It could do anything and everything you'd want a microscope to do. I was fortunate to be one of the first people using it. I spent weeks learning the software! Throughout my research, you can see the quality of the pictures I took off this microscope increase as I learned more of its features. Before long, if anyone – even doctorate students or professors – had a question or had to troubleshoot, they came to me. It was surreal, but I felt like an integral part of the lab. As an undergrad, it can be scary entering research because you are a small fish in a big pond. Once you start, the research community is accepting. Everyone was an undergrad once, so they understand your position. It's also incredibly rewarding to have high-level conversations with experts in the field".



## 2022

### Andrea Silva Santisteban Fort, Faculty of Arts

"I am a fourth-year Political Science student studying the relationships between Indigenous politics, social protests, extractive industries, and legislation in Latin America. As a Peruvian, studying the Indigenous population of my home country has made me more aware of my positionality, and the importance of context when studying social sciences and excluded communities. In past research projects, I used methods that prioritize objectivity. Nevertheless, my experience with PURE has allowed me to learn that subjective perceptions and relationships to peoples and cultures shape how we approach legislation, social protest, and politics more broadly. This research experience has also allowed me to further my knowledge of the ways social movements and protest are created and the impact they can have over time. Overall, acknowledging all the complexity of social movements and Indigenous politics has been huge in my research journey."



## Austin Shawaga, Faculty of Science

"I heard about PURE before I was officially a student at the University of Calgary. Today, I am in the fourth year of my program, majoring in Computer Science, and am completing my second PURE Award. Both years, my supervisor and I have been researching the privacy features of Android phones. Last year I focused on the privacy changes implemented across Android versions and this year, I am focusing on applications which cause private information to appear within the log files. My PURE Awards have been huge learning experiences. I went from knowing very little about the research process to being fully immersed in it. If I could give advice to potential PURE students, I'd say two things. First, that if research is of interest to you, don't be afraid to reach out to potential supervisors. Some supervisors are waiting to be asked, and programs like PURE make it easier for them to take on an undergraduate research assistant. Second, when you are in research, take it one day at a time. Every day I encounter something new. While there are some challenging days, the next discovery that cracks the whole thing open and makes it all worthwhile is just around the corner."



#### **Batool AlMousawi, Cumming School of Medicine**

"I am a Bachelor of Health Sciences student, concentrating in Psychology. My studies focus on population-level health and how the social determinants of health influence various health outcomes. For PURE, I conducted a meta-analysis on the mental health of youth before and after the COVID-19 pandemic. Mental health topics have always resonated with me. I have struggled with it myself. I come from a community where mental health is a stigmatized topic. Because I was able to witness that stigma firsthand, I was passionate about pursuing mental health topics in my studies, and about translating scientific research in ways that are accessible to the public. When applying for PURE, the initial supervisor search was intimidating. I was afraid of getting rejected or turned away for my inexperience, but I resolved to be brave. To ease my anxiety, I utilized the supports offered by the Undergraduate Research Initiative (URI). Talking about my concerns with others in similar positions as my own eased my worries. The URI also provided me with strategies to support my success. Once my research started, I still felt somewhat anxious to ask questions, but as I began fostering a relationship with my supervisor, I became more open. Their guidance helped me grow as both a student and future research professional. This experience has been the highlight of my undergraduate program thus far."



## **Bilal Rizvi, Faculty of Kinesiology**

"In first year, one of my professors inspired me to learn about research. He described it as finding answers to questions no one has asked. Later, when I heard about PURE, I was excited that I could do research for the first time, to collaborate with my supervisor on my research topic: the relationship between mental health symptoms and migraines in children and adolescents. A pivotal point for me was realizing that I had to learn how to be 'productively stupid'. In all my scientific learning to date, whenever there was a question, I expected myself to have the answer. If I knew it, I felt good about myself. If not, I felt bad. Doing PURE, I learned that research is about not knowing the answer and being comfortable in not knowing. Albert Einstein said, 'if we knew what we were doing, it wouldn't be called research, would it?' and I think he's right. If we had the answer, we wouldn't feel the need to dive into the unknown. Learning this has helped me personally, professionally, and academically. Now, I think, 'how can I use the resources I have to come up with the right experiment?'."



## **Bonnie Piercey, Faculty of Arts**

"My programs are a Bachelor of Science in Archaeology and a Bachelor of Fine Arts in Visual Studies. It's an unusual combination, but I'm finding that all my research interests are an interdisciplinary mix of the two. In 2019, I went on a group study program which visited ancient Pompeii, and I instantly fell in love with the site. I later took a class focusing on Pompeii and met my PURE supervisor. She had built a virtual 3D model of the House of the Golden Cupids – a fascinating ancient Pompeiian house which has an elevated theatrical stage at one end of its garden, and an intriguing sculptural collection. Our objective was to research and digitally recreate the house's wall paintings and sculptures, to decorate the 3D model. It has definitely been a formidable task! The house was excavated in 1902-03, with poor photographic documentation, and some artifacts have since been stolen or destroyed, while the rest of the sculptural collection is now largely inaccessible. During my project, I learned how to use Interlibrary Loans to access the two rare books which discuss the house, but one is written in German, and the other in Italian. In a moment of frustration, as I struggled with translation apps and missing information, my supervisor said something which has stuck with me ever since: those 'gaps' and 'walls' which a researcher encounters, are not stopping places - they're starting places. They are questions which no one has asked yet, so maybe I can be the one to ask them. As I work closely with these paintings and objects made by ancient Roman artists, I have begun to ask questions about their experiences and artistic processes. This PURE project has set me up well to begin my Honour's thesis in the fall, during which I hope to pursue some of these questions even further."



### **Dorothy Chacinski, Faculty of Arts**

"For my PURE research, I am investigating a semi-quantitative vascular burden scoring system for MR brain imaging at the Foothills Hospital with the Department of Clinical Neurosciences. This scoring system can be used in clinical settings and may be a valuable predictor of future cognitive decline and Alzheimer's disease biomarkers in stroke patients. As a mature student with work experience who took a hiatus from university, PURE has been invaluable in quickly bringing up my scholarly abilities to their potential. Being part of a full-time program has allowed me to immerse myself in research in a way I could not have before. Within a short timeframe, I have been exposed to emerging studies in dementia and exciting new technologies, which has enriched my multi-disciplinary understanding of this field. Additionally, I have been able to practice my soft skills within a clinical setting, improving my confidence in working with patients. PURE has further supported me in expanding my network; I have been connecting with other scholars and peers at the Hotchkiss Brain Institute, attending conferences, and meeting potential graduate supervisors. The program has also opened the doors to collaborative environments within the wider research community that I didn't even know existed, further expanding the possibilities of my research. I would not have had these opportunities, nor would I have built my scholarly skills in the same way, without PURE."



### **Douglas Li, Faculty of Science**

"I am a Bachelor of Science student, specializing in Biochemistry. My PURE research investigated the effects of tetrahydrocannabinol (THC) on lipids in lung surfactants. 82% of vaping lung injuries are caused by THC-related products, which can create medical problems. I applied for PURE at the recommendation of my supervisor. He was my course instructor, and I had an excellent mark in his class. I was proud to get a PURE Award and felt confident in my abilities. One day, I was at a lab meeting with my PURE supervisor and his graduate students. I was the only undergraduate student there. As I listened to them speak, I thought I could understand at first, but the more technical they got, the more I realized that I have so much to learn in this field. I was astounded by their ability to pick out a small percentage of error in each other's work so quickly. It taught me that I need to be humble and always look for ways I can improve. Humility also applies to the research process. Not everything is ideal. When something goes wrong, being humble will allow you to think critically about how to figure things out. I want to share this lesson when I become a science teacher. My supervisor has done well teaching me, and I'd like to pick up the torch and help the next generation."



## Harsimrit (Sim) Lakhyan, Faculty of Nursing

"My PURE research was a scoping review on virtual simulation use for professional development in nursing. One of the core principles of nursing is lifelong learning, yet research has found that many nurses encounter a lack of professional development opportunities in their careers. When I think back to my PURE experience, what stands out is how interested my supervisor was in my learning and experience. At the start, she was quick to say that we were working as peers and colleagues, not as a traditional hierarchy. This approach energized me, as my contributions were just as important as hers. She's also an Intensive Care Unit (ICU) nurse, so I got to explore a branch of nursing I didn't know would be of interest to me. Earlier in my degree, I didn't like having more patients than I could get to know. Nursing students always start with one and then work their way up to three. By that point, on the one hand, you're always busy, but on the other, you don't get to know your patients as well. As I learned, ICU is a great blend of the two. One day in PURE, my supervisor asked me about my area of interest. When I told her, she said I would make a great ICU nurse. It was so affirming."



### Justine Bui, Faculty of Arts

"I am a Bachelor of Fine Arts student, majoring in Visual Studies with a minor in Computer Science. My PURE research topic is on skin colorism in Asian communities. Most individuals believe that the fine arts are about creating objects that are visually appealing. However, art is much more than that, and is rather a powerful method to communicate certain messages, bring awareness to indescribable topics, and aspire for radical change. Once you find a topic you are passionate about, it's the starting point of all your research. You begin asking questions like, what is the history of this topic? How is it continuing to happen? How can you stop it? All this translates into your art. My medium to showcase my research is an installation, which is a variety of mediums combined. I chose this because it's so hard to speak about skin colorism in just one way. There will be a wall mural showing the ingredients in skin whitening products I found in Calgary stores. There will also be a sculpture depicting the physical impacts of these products on skin. I also want to do photography depicting the emotional impacts of skin colorism. If I could encourage other students, I'd say to take to be adaptable, flexible, and open-minded. If you don't have the knowledge, don't worry, you'll research it and learn along the way."



## Madeline MacLean, Faculty of Arts

"I am Bachelor of Arts (Honours) in Linguistics with a minor in Speech Language Sciences. My PURE research was the perceptions of others' emotional states through their tone of voice. When I first started PURE, I thought research would be independent. I am very fortunate to have collaborated with fellow linguists where I attended regular meetings that my supervisor set up with me and her graduate students. Each week, we'd talk about our experiences, road bumps, and what articles we are reading. For me, these meetings solidified the importance of community in research. Collaboration is the nature of academia - it's asking your peers for their thoughts and opinions to strengthen your research and knowledge. Even though we aren't working on the same project, we learn from each other. Such a sense of community is so important in your success as a student, as a researcher, and in life. Likewise, I've also gained a sense of independence in research. I've connected learning from past coursework to my research project, which was valuable as I was able to see the information I learned in real-life application. This fall, my PURE research will be the foundation for my honors thesis. I am hoping my findings will give insight to voice recognition software like Siri or Alexa. There are speech disorders that impact tone of voice, and one day, I would like my findings to contribute to clinical knowledge and practice, and inform theories on language perception, prosody, and psycholinguistics."



### Nadia Bibi, Faculty of Nursing

"When I reflect on my PURE Award, I feel as though my undergraduate research journey has become increasingly personal and has allowed me to connect parts of my identity to my academic pursuits. I am a third-year student in the Faculty of Nursing, and I am pursuing research about a strength-based perspective on mental health that has risen in popularity post-pandemic, and its connection to traditional Islamic philosophy. However, this was not my original topic, as I initially planned to explore strength-based mental health manifestations in health care contexts. The interest to explore this subject's link to Islamic doctrines arose from a discussion at a PURE workshop about types of evidence that are not utilized in mainstream academic discussions but should be. There was a section on the usability of Indigenous sources which influenced me to connect my own background to my project as Islamic thought too is rarely applied in Western academic spaces. This subject matter alludes to a greater theme of humanity which I hope to explore through my work. Humanity is a critical part of the nursing discipline, as nurses care for patient's physiological health but must also incorporate a degree of concern for the mental and emotional state of the patient. Thus, my research parallels the general purpose of the nursing discipline as it aims to connect commonalities between the manifestation of mental health as a strength in two seemingly distinct societies. Upon completion of my PURE research, I have appreciated how the process impacts the researcher's personal capacity for lifelong learning, and the necessity for researchers to share stories about their cultures for greater inclusion and diversity in respected academic positions."



#### **Nicole Ferguson, Faculty of Arts**

"I am a Bachelor of Arts student majoring in Linguistics and minoring in Speech Language Sciences. I am also pursuing an honours degree. It's funny, I knew I wanted to do an honours thesis, but I didn't know much about PURE. My supervisor encouraged me to apply to begin researching my honours topic, and to gain research experience. I am creating a database of pronoun systems in languages. Specifically, I am interested in how languages express politeness through pronouns. When you address somebody using a pronoun, depending on the language you are speaking, you may want to use a formal pronoun (perhaps this person is an authority figure, or a monarch!). I want to know if these formal pronouns are built into the pronoun system to mimic an already existing form, or if they are only used to express formality. Once this database is complete, we'll have a big picture of how these pronoun systems are constructed cross-linguistically. Throughout this work, I've reflected on how people often assume that research must be original and profound. They also might feel like they must have all the answers, but why do research if you have all the answers already? As my supervisor often says, research can be fun and exciting. I love this. I've been able to take what is already known and apply my knowledge in a new way. It takes the pressure off and allows me to do research just because I enjoy it."

Dalaar	la.	204	Pland
Dalaar	105	ard	Piural
Ralaar	alr	3rd	Distal
Balear	los	3rd	Plural
Balear	15	3rd	Plural
Balear	les	3rd	Plural
Balear	ho	3rd	Plural
Balear	mi	11	Singular
Balear	jo	(Ist	Singular
Balear	nosaltres	(Ist	Plural
Balear	vós	(2nd)	Unmarked
Balear	tu	(2nd)	Singular
Balear	vostė	2nd	Singular
Balear	vosaltres	2nd	Plural
Balear	vostės	2nd	Plural
Balear	el	3rd	Singular
Ralear	alla	244	a france from the second

### Noelle Thundathil, Faculty of Science

"I am a third-year Bioinformatics student in the Bachelor of Health Sciences program. My research journey began in high school, which allowed me to learn about cancer research, expand my knowledge of the field of bioinformatics, and gain unique skills. Currently, under PURE funding, I'm conducting a research project that will allow me to explore the genetic diversity of the canine hookworm by sequencing different mitochondrial markers at depth. My project will help me investigate how resistance to drug treatment may have arisen in pet dog populations in the USA. It's been fascinating, as I get to apply my interest in bioinformatics and genetics to Veterinary Medicine. Although my research journey has been fulfilling, it has not been easy. I've come to learn that things won't always go as you plan, and at times, you'll face challenges. The most important thing is to keep pushing yourself and find ways to develop your skillset amidst difficulty. For example, the method of data analysis I used in my previous project had a lot of bugs that were time-consuming to resolve. Eventually, I switched my method of analysis, but due to time constraints, I was unable to participate in a research symposium I looked forward to. Even though my project didn't go as planned, I found that I was able to learn more because of my challenges. During that project, I was pushed to connect with researchers in a new environment and test my problem-solving abilities. It was humbling, and I learned that in research, it's about learning and growth, not about your destination."



## Rakshit Narayanan Devaraj Baskar, Faculty of Science

"Throughout childhood, my parents encouraged me to try something that would help those around me. We are not alone in this world, as we are a connected web of life! If the people around us are having a good life, then we will have a good life, too. From this encouragement, I moved to Canada after high school to study, which will aid me in this. It has been a lifechanging experience. The University of Calgary has provided me with so many opportunities to research, explore and contribute back to our community. For PURE, my supervisors, the Alternative Vectors for Carbon Storage (AVECS) team members and I researched sustainable ways to remove raw carbon dioxide based on biomass conversion technologies. This is a growing, necessary research area in our world today, aligning with increased efforts for sustainability, conservation, and environmental reconciliation. I started by doing a literature review. This was a bit of a task because it wasn't like writing an annotated bibliography. Rather, we had to synthesize and apply our learning to real-world experiments. One day, I got to conduct my first real-time science experiment. It was a true research process because we didn't know what would happen and this 'waiting in expectation' is a part of the scientific way. Happily, we got the results we expected, encouraging us to continue with more ones. Now, every two weeks I present data summaries and new learning from scholarly literature to the research team. This has been a great learning opportunity. I love to meddle with things, and 'research, in a way, is like scientific meddling'. If research interests you, please explore your opportunities, and just try it! No matter what, you will take away new knowledge or skills, while also benefiting those around you, making our planet one big family!"



### Sharmaine Tay, Werklund School of Education and Faculty of Arts

"My program is a concurrent Bachelor of Education and Arts. I am doing a double major in English and Education with a minor in Philosophy. In PURE, I brought together my favorite parts of my degrees and made connections between academics and practice that I wouldn't have been able to otherwise. Along the way, I've had to trust the research process. The PURE project I proposed wasn't what I ended up doing. There was an unexpected hiccup at early on, and I was at a crossroads - I could quit, or I could explore the possibilities. This made me realize that my research identity needs to be flexible. I won't always know where I am at, and though the unexpected may happen, there are still ways to honor the ideas and values I entered the research with. The more I trusted in the research process and my supervisor's mentorship, the more I realized that flexibility in research often means pivoting to the better option for the researcher and for the project. Even my research findings reflect this idea, that when forced into a new environment (like the unprecedented challenges of the pandemic), it is not only possible but imperative to remain flexible and create a path forward that is better than the one we started with."



## Simon Hus, Schulich School of Engineering

"Early in first year, I knew I wanted to explore diverse topics before specializing in mechanical engineering. When I connected with my PURE Supervisor in the Department of Physics and Astronomy, he invited me to join his project building a quantum communication system. Every week I learn something new, yet I also apply existing knowledge in new ways. This combination has been surprising and has directly benefitted my research. Since I didn't have any experience with quantum physics, I had to read up. The basic background connected to a past linear algebra course, and I was surprised that I could follow along with it. I am also using gradients from calculus, conducting circuit analyses to interact with code, and creating simulations in Python, all of which I learned in my first-year Engineering courses. I am also learning more about physics. The machines in our circuitry operate with processes I learned in class, and I must learn new physics formulas to make sure we don't break the electronics. From this, I see that the connections between the theoretical and the technical are more present than one may think. In a course, experiments are designed to give a certain result, so you learn a specific thing. In research, you'll know the goal, but you won't know the path – it's up to you to figure that out."



## Sofia Celis, Cumming School of Medicine

"I am a Bachelor of Health Sciences student, majoring in Health and Society. In 2021, I joined a large research project on long-term care workers' mental health during the COVID-19 pandemic, particularly the concept of moral injury. Moral injury is like post-traumatic stress disorder, but distinct in key symptoms, e.g., instead of flashbacks, individuals experience intense feelings of shame and guilt. I was so interested in this work, that I continued with this project and research team for my Health and Society practicum. Today, as a PURE Award recipient, I am continuing my analysis from my practicum, and bringing it to completion by writing a publishable paper. Collectively, these experiences have taught me how to pioneer my own research study. In my practicum, I learned from my supervisor and the research team, who taught me independent research skills. In PURE, I had to set my own deadlines and goals, and discipline myself to achieve them. I finished PURE with a sense of confidence that I didn't anticipate. It's also been rewarding to uplift the voices of long-term care workers and advocate through social change through research. I am so passionate about social justice and science, so to merge the two in one project has been amazing. This fall, my PURE research will form the basis of my honours thesis."

