Report on the University of Calgary
Teaching and Learning Grants Program 2014-2019

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UNIVERSITY OF CALGARY
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Introduction

The purpose of this report is to provide an overview of the University of Calgary Teaching and Learning Grants Program for the period of 2014 to 2019. Funded by the Provost's Office, these Teaching and Learning Grants are designed to enhance students' learning experiences at the University of Calgary. Specifically, they support the development, implementation, critical examination, and dissemination of innovative, evidence-based approaches to student learning in order to:

1. integrate research evidence into teaching practices;
2. generate new knowledge about teaching and learning at the University of Calgary; and
3. disseminate the results of that work to benefit others.

This report has been divided into seven sections. Section One sheds light on the number of applications which the Taylor Institute for Teaching and Learning (hereafter referred to as the TI) has received across different application streams over time. Section Two discusses how much funding has been made available for grant projects each year, and how grant recipients distribute the funds in their budgets. Section Three provides the breakdown of the grants awarded every year by faculty and non-faculty units[1]. Section Four discusses the official roles and ranks of the principal applicants and project collaborators. The statistical descriptions in this particular section will illuminate who shows interest in applying for teaching and learning grants among academic and non-academic staff at the University of Calgary and their success rates. Section Five highlights the venues through which grant recipients have disseminated project results. Section Six offers a summary of the impact of the Grants Program, and Section Seven provides a brief list of recommendations moving forward.

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[1] Non-Faculty Units include the Taylor Institute, Student and Enrolment Services, and Libraries and Cultural Resources.

Executive Summary

The University of Calgary *Teaching and Learning Grants Program* has allocated a total of $3,867,289 to 190 projects from 2014 to 2019. 302 grant applications (2014-2019) have been submitted in total, where 63% of projects have been funded. Projects have been funded through four grant streams: Practice Grants, Lesson Study Grants, Scholarship of Teaching and Learning (SoTL) Grants, and Development and Innovation Grants. The 2019/2020 grant cycle yielded the highest number of applications (60) and funded 65% of received applications.

In terms of budgets, most funds requested are for Research Assistant (RA) wages, conference-related costs, as well as services and honorarium expenses. Consistently, throughout each grant cycle however, the majority of funds allocated are for research assistant (RA) wages. Overall, 57% of funds requested from 2014 to 2019 were to pay for research assistance.

Most grant applicants come from five faculties: Arts, Education, Medicine, Nursing, and Science. Environmental Design, Law, and Kinesiology faculties have submitted the least number of applications. The most diverse participation in a single year was evidenced during the 2019-2020 grant season with applications from 11 units. Most applicants are Instructors (35%), Assistant Professors (23%), Associate Professors (20%), and Professors (11%). This group of applicants also has the highest grant approval rate. The remaining 11% hold non-teaching, administrative or research roles within the institution. Further efforts may be warranted to support under-represented groups.

Grant-supported research has been presented locally, nationally, and internationally. Final Reports submitted by grant holders indicate that research has been disseminated via 43 local presentations, 149 conference presentations more broadly, and in 39 publications (2014 to 2018). Considerable post-grant research dissemination also occurs which is not currently captured in the current reporting structure. Grant recipients have presented their findings across Canada and the United States as well as in conferences beyond North America, in places such as Spain, South Africa, Switzerland and Brazil.

Sections One through Five of this report provide a quantitative overview including application streams and approval rates, grant budgets, grant breakdowns by faculty, a profile of principle grant holders, and project dissemination results. Section six provides a Summary of Impact intended to offer a qualitative picture of the scope of work supported through the University of Calgary Teaching and Learning Grants Program and its impact. In this section, a series of project summaries demonstrate the diversity of projects across faculties, grant streams, project types, generated impact, and grant cycles. The content is organized into common impact themes including: Knowledge Creation on a Global Scale, Focus on Student Learning and Well-being, Experiential Learning, Learning Technologies, and Ripple Effects.

As a result of this review, nine recommendations for improving the University of Calgary Teaching and Learning Grants Program are outlined in Section Seven. These recommendations address modifications to streams, student involvement, support, reporting and tracking practices.

Section 1: Application Streams and Approval Rate

The Grants Program has received a total of 302 grant applications over the past six years (2014-2019). Of 302 applications, 190 (63%) applications have been funded. All applications are reviewed and adjudicated through a committee chaired by the Vice-Provost (Teaching and Learning) or designate, two academic staff, an undergraduate or graduate student, and a representative from the TI. There were 60 applications submitted in 2019, which is the highest number of grant applications received in a single year. The number of funded applications has varied every year. The lowest funding rate was in 2018 when 23 grant applications (52%) did not receive funding. The highest approval rate was in 2016 when 40 applications (69%) were funded.

Table 1. Distribution of Applications Received, Funded, and Unfunded, by Year (2014-2019)

Grant Applications	2014	2015	2016	2017	2018	2019	Total
Received	46	42	58	52	44	60	302
Funded	26 (56.5%)	26 (62%)	40 (69%)	36 (69%)	23 (52%)	39 (65%)	190
Unfunded	20 (43.5%)	16 (38%)	18 (31%)	16 (31%)	21 (48%)	21 (35%)	112

Grants have supported projects in five streams:

- Practice Grants;
- Lesson Study Grants;
- Scholarship of Teaching and Learning (SoTL) Grants – Individual;
- Scholarship of Teaching and Learning (SoTL) Grants – Collaborative; and
- Development and Innovation Grants

This figure illustrates how grant applications were distributed across these streams. In 2014 and 2015, all grant projects were funded in three grant streams. Between 2016 and 2019, 138 applications were funded across four grant streams.

Figure 1. Funded Applications, by Grant Stream (2014-2019)
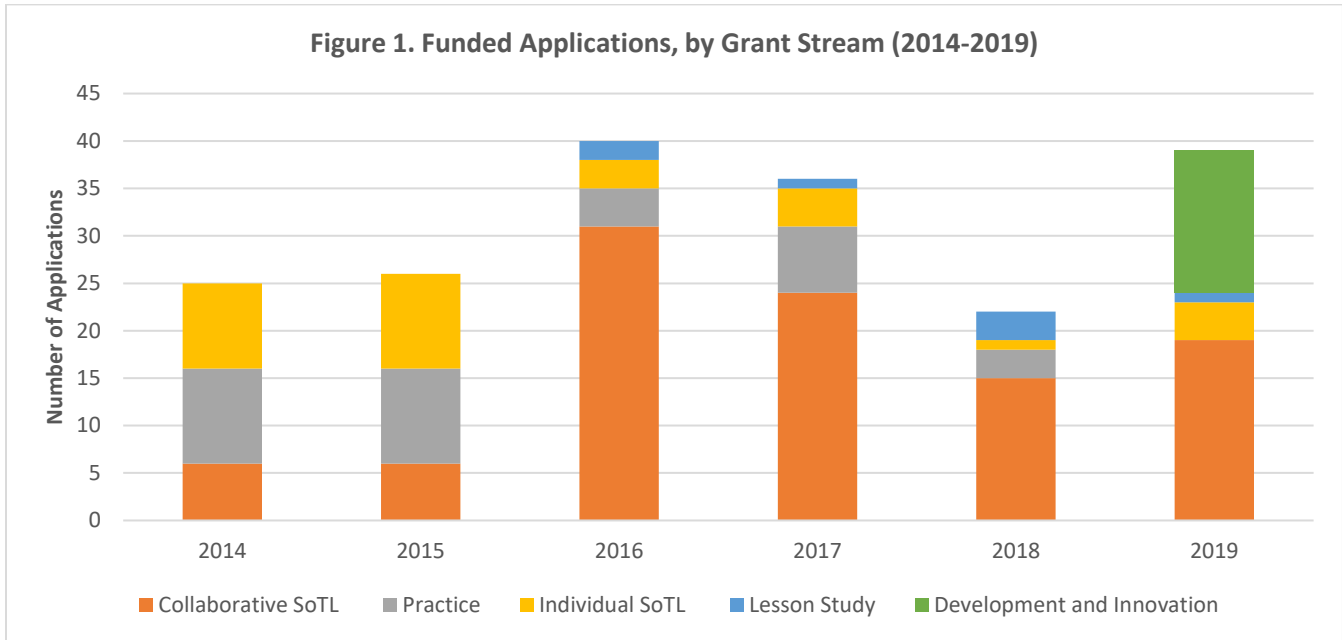
The SoTL Grants (Collaborative) stream has received most of the funding across all six years. Out of the 190 funded applications, 101 (53%) fall under this stream. The Lesson Study Grant stream has, on the other hand, resulted in the fewest number of grants funded. Only seven applications that fall under this stream have ever been funded. The Practice Grant stream was discontinued after the 2018-2019 year. The following year, the Development and Innovation Grants stream was introduced (2019-2020). Despite being a new stream, a great number of applications were funded under this stream (15 out of 39).

Section 2: Grant Budgets

Between 2014 and 2019, a total amount of $3,867,289 has been allocated to 190 applications.

Table 2. Distribution of Funding Available, Requested, Granted, and Unspent, by Year (2014-2019)

Year	Funds Available	Funds Requested	Funds Granted	Unspent Funds
2014-2015	$750,000.00	$912,289.00	$433,424.00	$316,576.00
2015-2016	$1,000,000.00	$833,540.59	$405,364.00	$594,636.00
2016-2017	$1,000,000.00	$1,415,405.87	$977,862.00	$22,138.00
2017-2018	$750,000.00	$ 1,353,519.34	$749,971.00	$29.00
2018-2019	$750,000.00	$ 916,058,67	$515,498.00	$249,502.00
2019-2020	$750,000.00	$ 1,174,094.10	$785,170.00	-$35,170.00

The amount of funding applied for and the amounts granted have varied. As shown in Figure 2, all the applications combined in 2016-2017 totalled nearly $1.5 million in funding, which is the highest amount requested in a year. In the same year, $977,862 was spent, funding a total of 40 applications. This was the highest amount of funding allocated in a single year. In 2019-2020, unlike in previous years, $35,170 more was spent over and above the allocated budget, funding 39 applications.[2]

Figure 2. Distribution of Funding Available, Requested, Granted, and Unspent, by Year (2014-2019)

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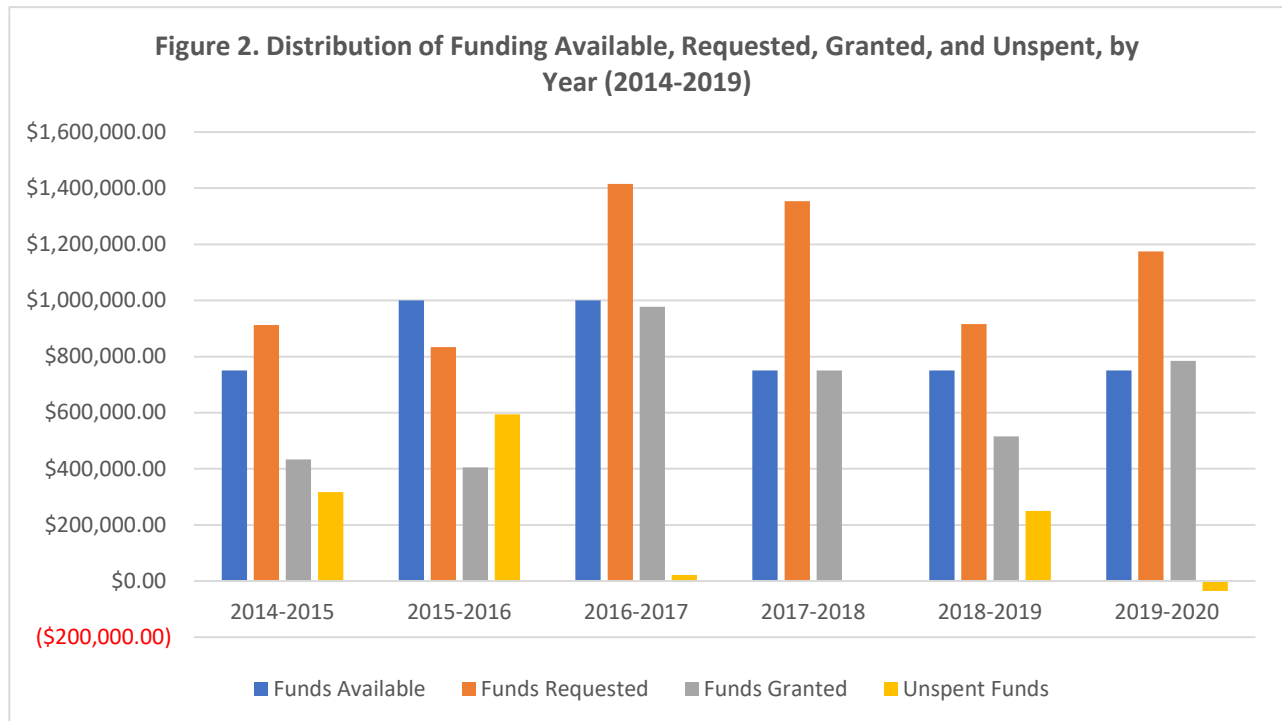
[2] The excess amount of $35,170 consisted of the Senior Director's use of the previous year's unspent funds.
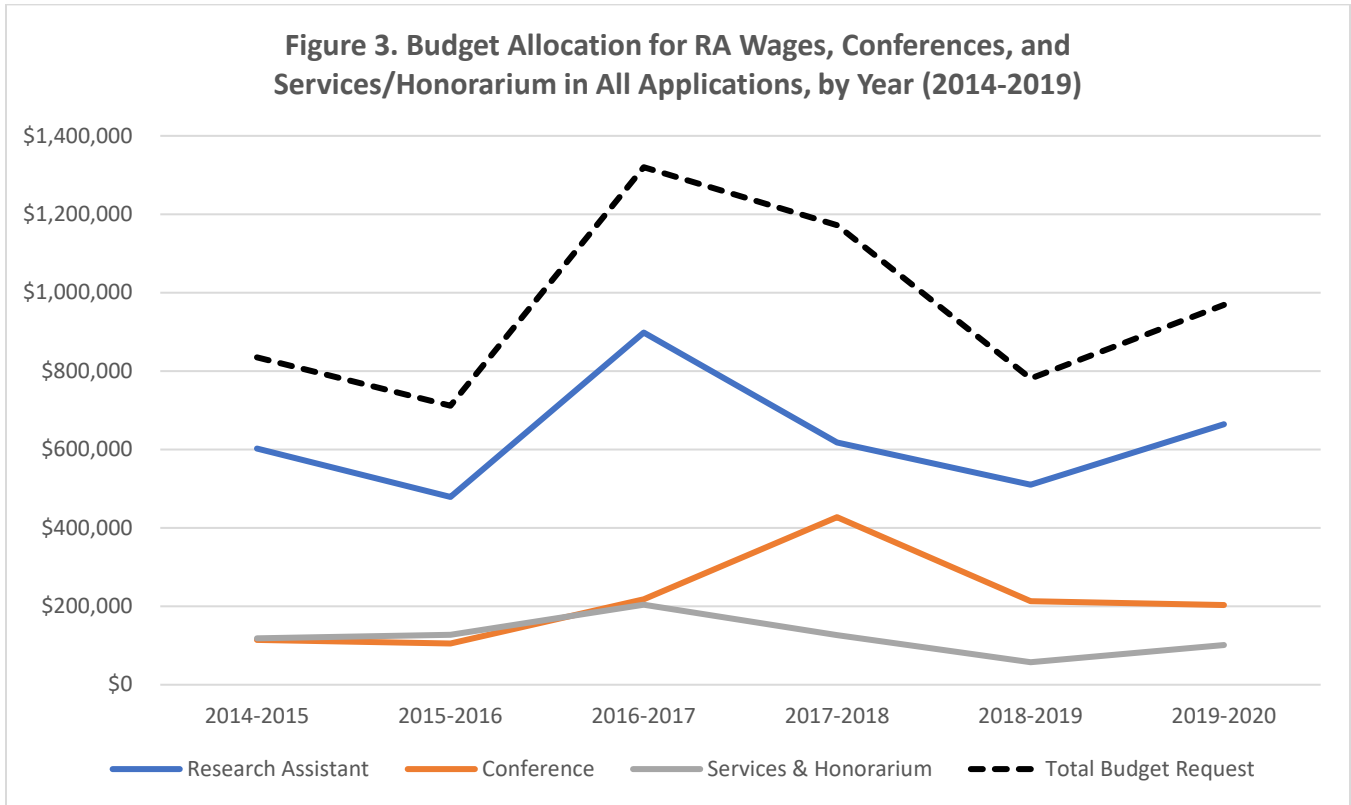
The 2019/2020 grant season saw the highest number of applications received and saw spending over and above the available budget, to fund 65 percent of the applications received.

How do grant recipients budget their funding requests? The type of project activities and resources for which the funds are requested every year varies, depending on the nature of projects. Most of the requested funds are, however, allocated for research assistant (RA) wages. Of the total $6,604,907.57 in funds requested in all applications from 2014 to 2019, $3,772,273 (57%) was requested for RA wages. Conference costs, as well as services and honorarium expenses, make up the other two major sources of project funds requested.

Table 3: Budget Distribution, by Budget Allocations in All Applications (2014-2019)

Year	Research Assistant	Software and Material	Conference	Services and Honorarium	Non-Conference Travel	Workshops	Publications	Other Costs
2014-2015	$602,785	$74,440	$114,211	$118,289	$17,660	$3,828	$5,000	$50,516
2015-2016	$478,984	$68,515	$105,177	$127,492	$26,885	$3,065	$8,738	$14,684
2016-2017	$898,305	$46,252	$217,622	$204,113	$28,008	$4,557	$11,249	$5,300
2017-2018	$617,642	$55,996	$427,399	$126,826	$30,502	$53,860	$39,920	$1,375
2018-2019	$510,479	$38,752	$212,956	$57,432	$5,934	$44,225	$19,595	$26,686
2019-2020	$664,079	$68,826	$202,929	$101,629	$16,243	$12,400	$27,234	$80,755
Total	$3,772,273	$278,340	$1,280,293	$735,781	$125,232	$121,935	$111,736	$179,310

Notes: The 'Research Assistants' categories refers to wages for RAs. The 'Conference' category are costs associated with conferences (e.g., flights, hotels, cabs, registration fees, etc.). 'Software and Materials' are costs related to office supplies, survey subscriptions, and project-specific software subscriptions. The 'Services and Honorarium' category refers to paid services and honorariums to individuals who are not on the research team (e.g., transcriptionists, video editors, project coordinators, hospitality-related costs for meetings/study participants such as refreshments, gifts cards, etc.). 'Non-Conference Travel' consists of travel related to the project, not including conferences; examples include mileage incurred travelling to a conference, to another campus for focus groups or interviews, to a workshop, or to a field work location for data collection. 'Workshops' refer to applicants who facilitate a workshop for professional development purposes. 'Publications' are fees for publishing. Lastly, 'Other' is a category for budget expenses that do not fit into one of the other listed categories and vary according to the project (e.g., teaching release, venue admission fees, webinar costs, printing costs, miscellaneous, etc.).

Figure 3. Budget Allocation for RA Wages, Conferences, and Services/Honorarium in All Applications, by Year (2014-2019)
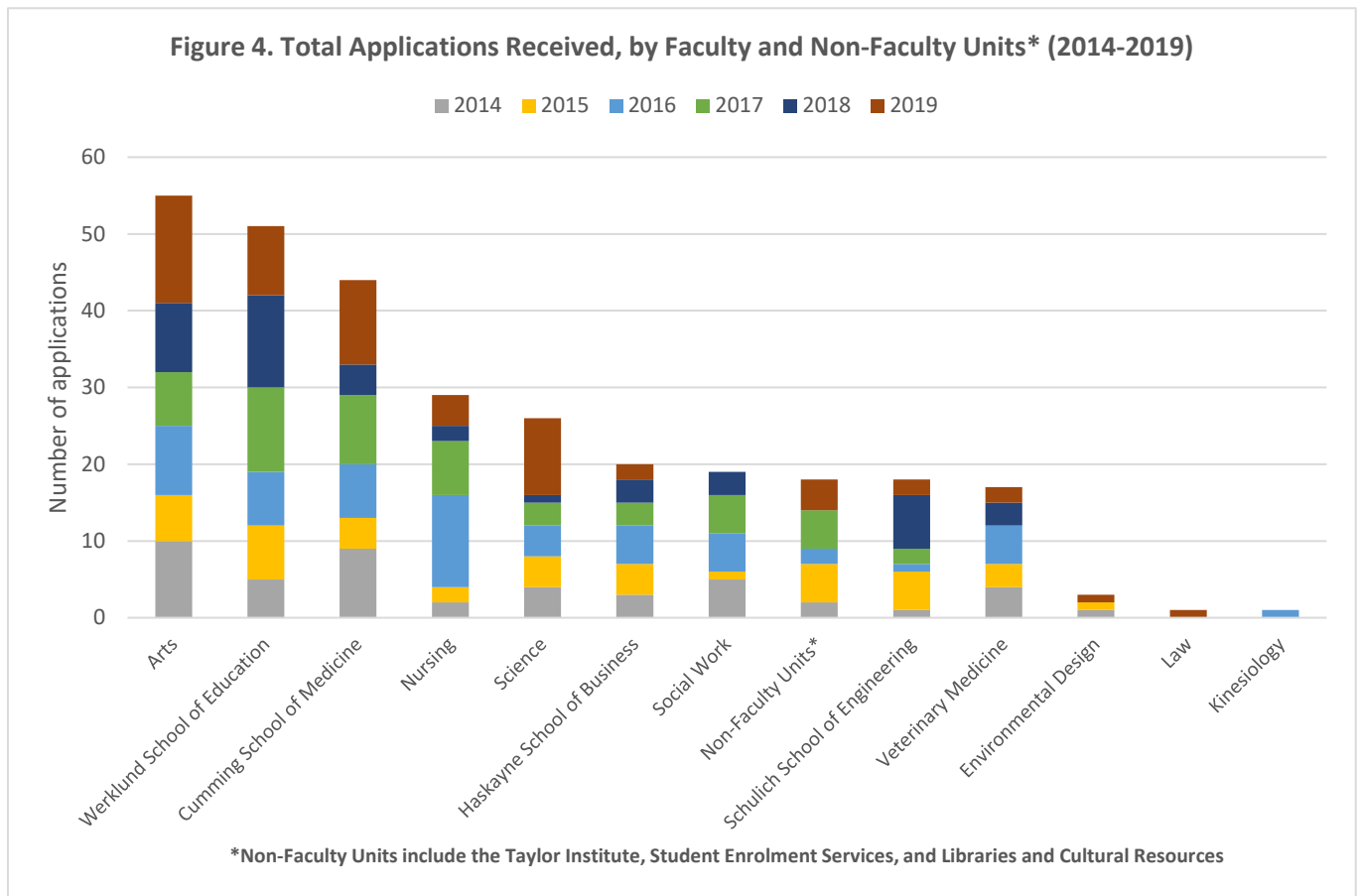

As shown in Figure 3, the allocated budgets for RA wages in all applications impact the total amount of requested funding every year. The amount of requested funding for conference costs and services and honorarium expenses every year have remained consistently lower than RA wages with little variation. Requested funds for RA wages have varied in the same pattern as the total amount of requested funding every year. In other words, the more funds the applicants request for RA wages, the higher the total amount of requested funds have, historically, been.

Section 3: Faculties

Applications have been submitted from various faculty and non-faculty units over the past six years. The number of applications, however, varies across faculty and non-faculty units. As depicted in Figure 4, while the Faculties of Arts, Education, Medicine, Nursing, and Science make up the five major sources of grant applications, the Faculties of Environmental Design, Law, and Kinesiology have submitted the lowest number of applications. Consistently, five faculties – Arts, Education, Nursing, Medicine, and Science have submitted applications over all grant seasons. However, in 2019-2020, applications were received from 11 faculty and non-faculty units, which is the most diverse faculty and non-faculty participation in a single year since these grants were first made available.

Figure 4. Total Applications Received, by Faculty and Non-Faculty Units* (2014-2019)

*Non-Faculty Units include the Taylor Institute, Student Enrolment Services, and Libraries and Cultural Resources

Four Faculties – Arts, Education, Medicine, and Nursing – have submitted the majority of applications between 2014 and 2019. Compared to the Faculties of Arts, Education, and the Cumming School of Medicine, Faculty of Nursing has had fewer applications funded (see Figure 5).

Figure 5. Funded Applications, by Faculty and Non-Faculty Units* (2014-2019)
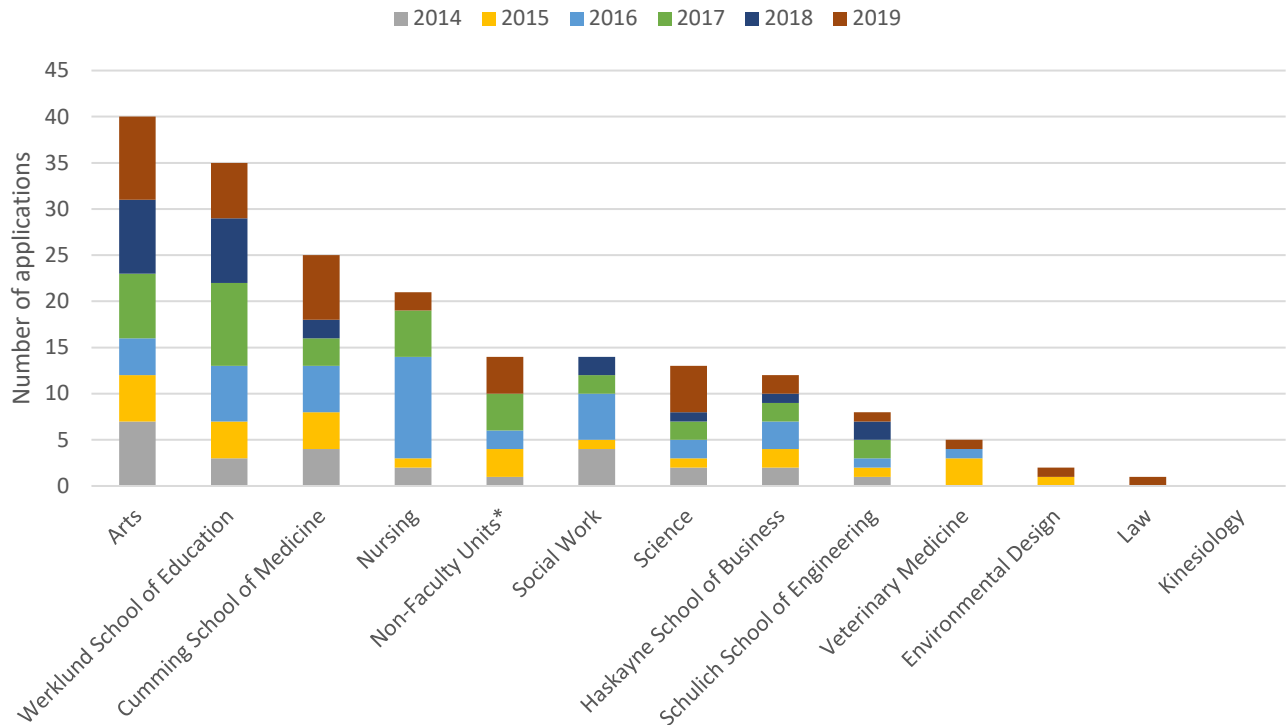
*Non-Faculty Units include the Taylor Institute, Student Enrolment Services, and Libraries and Cultural Resources

The Faculties of Environmental Design and Law have received funding for two and one grant projects, respectively. The Faculty of Kinesiology remains the only Faculty which has never received funding.

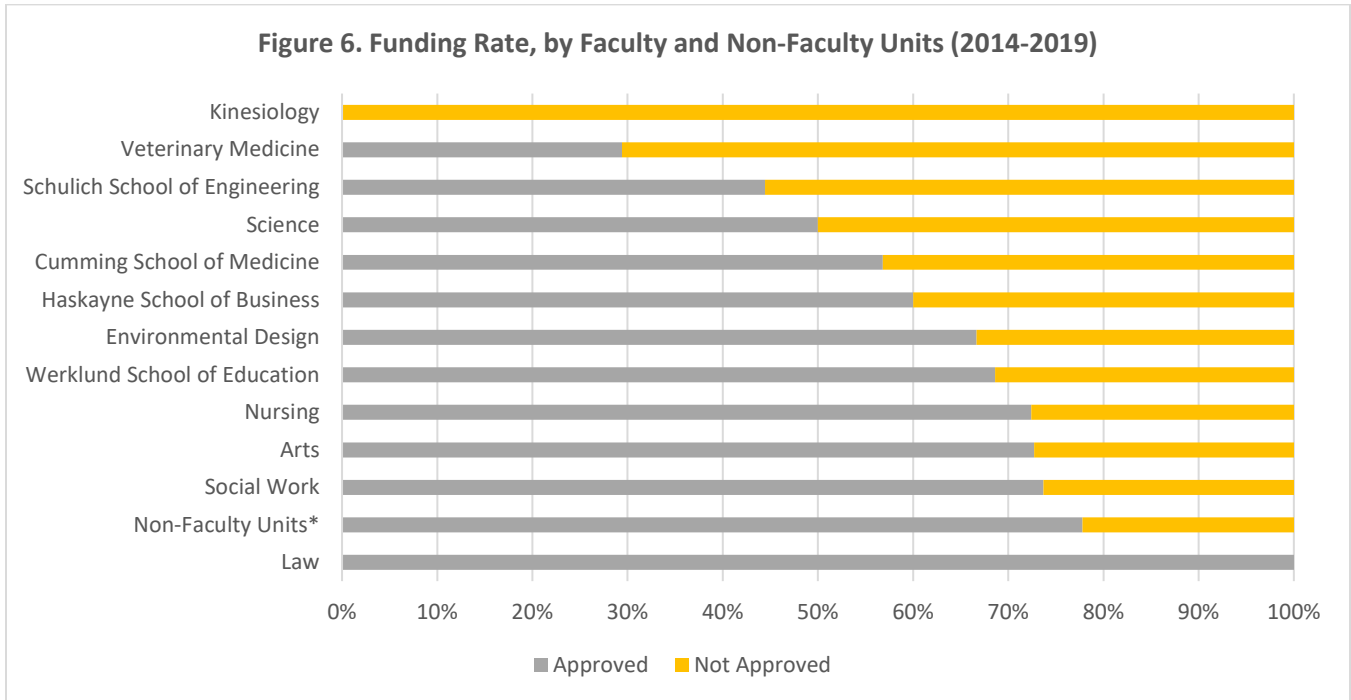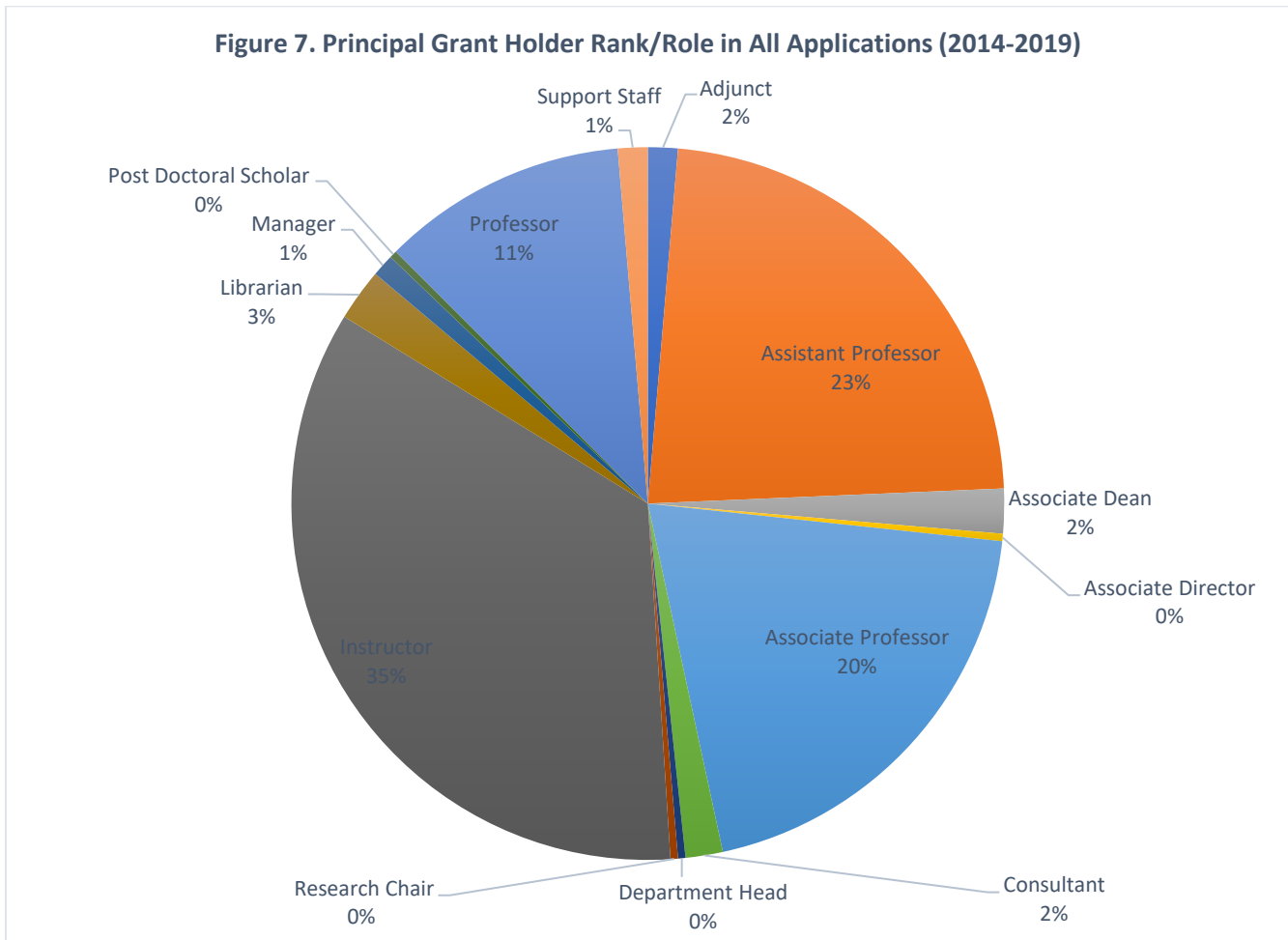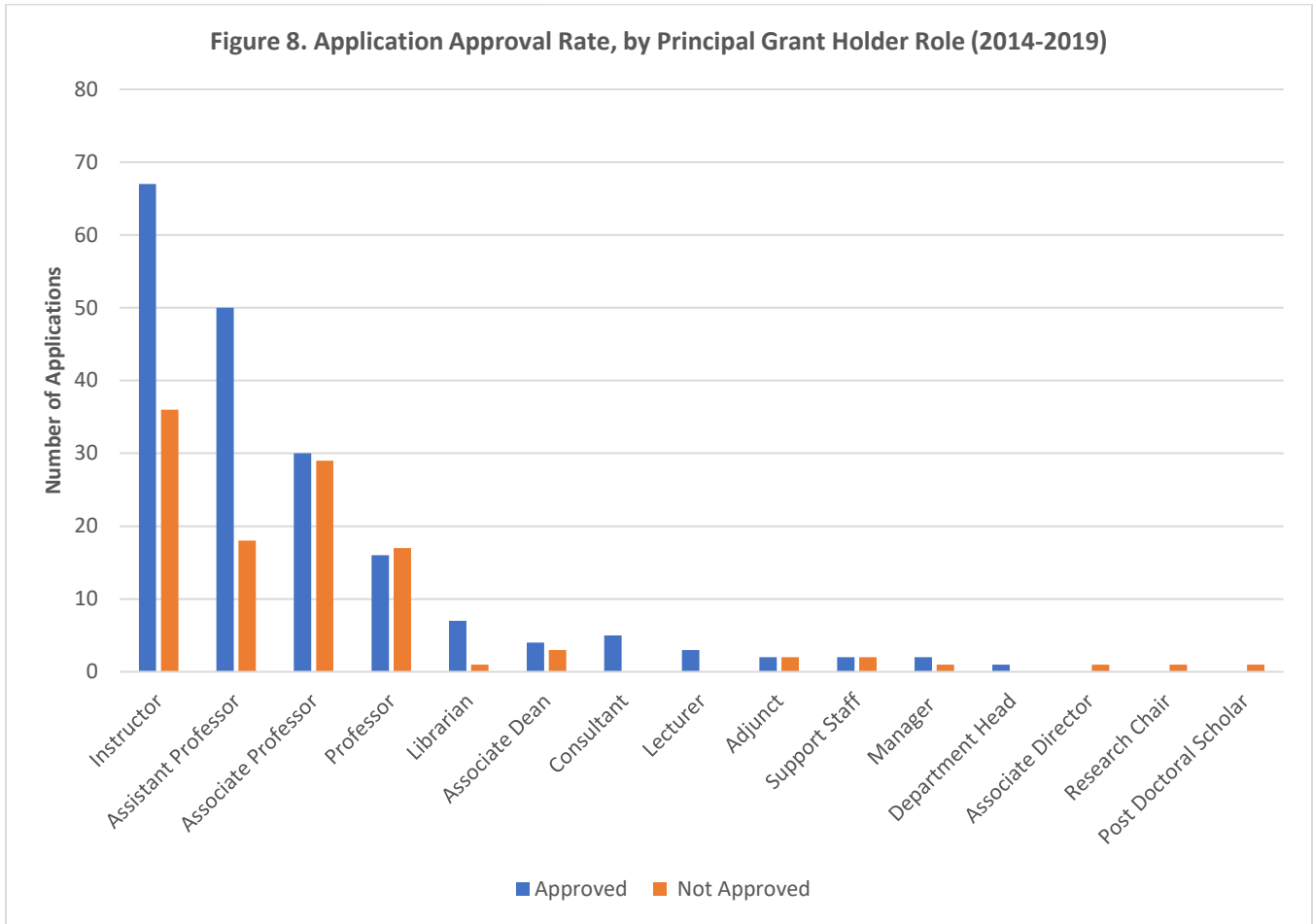**Figure 6. Funding Rate, by Faculty and Non-Faculty Units (2014-2019)**

Figure 6 shows the rate of funded applications across all faculty and non-faculty units. The Faculty of Law has the highest approval rate, but it should be noted that only one application from has been received and funded from the Faculty of Law since 2014. Applications from non-faculty units have the second highest approval rate, after the Faculty of Law. The Cumming School of Medicine, in particular, ranks third in terms of the frequency of applications across all six years but ranks ninth in securing funding. After Kinesiology, applications from the Faculties of Veterinary Medicine, Engineering, and Science have had the lowest success rate. Kinesiology remains an exception in this case. Only one application was received from this Faculty in 2016, which failed to secure funding.

Section 4: Principal Grant Holders and Project Collaborators

The roles occupied by principal grant holders across all submitted applications (funded and unfunded) are diverse, as is depicted in Figure 7. Most of the applicants are Instructors (35%), Assistant Professors (23%), Associate Professors (20%), and Professors (11%). The remaining 11% of applicants hold non-teaching, administrative, or research roles within the institution.

Figure 7. Principal Grant Holder Rank/Role in All Applications (2014-2019)

Figure 8. Application Approval Rate, by Principal Grant Holder Role (2014-2019)

Instructors, Assistant Professors, Associate Professors, and Professors have the highest approval rate. This suggests both that those applicants who have some teaching responsibilities (except for adjunct staff) are more likely to not only apply for grants but also receive funding than the applicants whose primary responsibilities are research and/or administrative in nature, and that further efforts may be warranted to support other applicant groups.

Similarly, of the 463 collaborators whose rank or role were noted, Instructors (21%), Assistant Professors (14%), Associate Professors (12%), and Professors (10%) made up the majority of collaborators in both funded and unfunded projects, as shown in Figure 9.[3] However, students (15%) – while they cannot apply for Teaching and Learning Grants as principle grant holders – appear to compose the second highest participation rate as project collaborators.

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[3] A total of 610 collaborators were listed; ranks/ roles were included for 463 collaborators, whereas 147 did not include ranks/roles. As is indicated above, reported percentages therefore only reflect the 463 collaborators whose ranks/roles were noted.

Figure 9. Project Collaborator Rank/Role in All Applications (2014-2019)
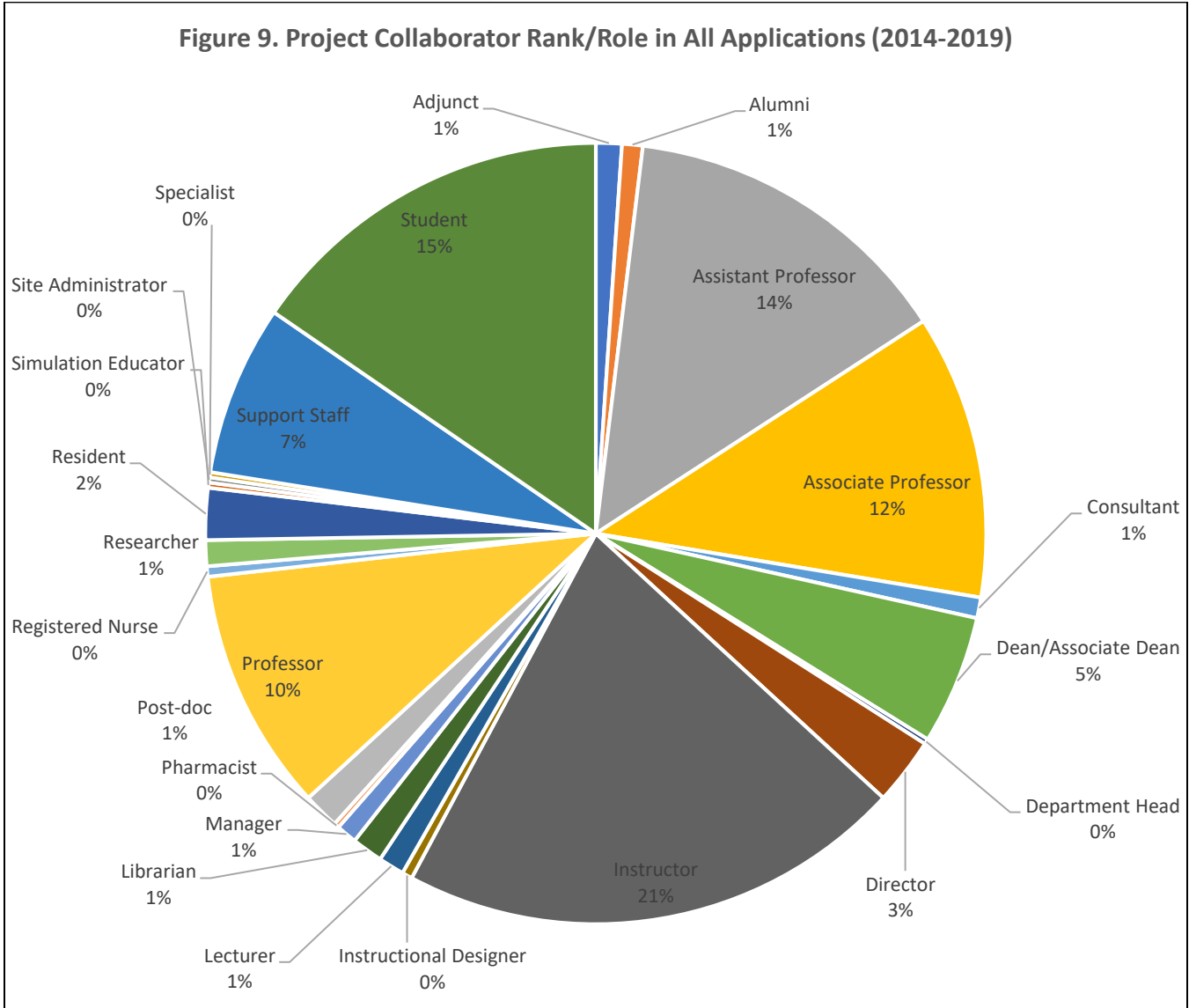

There are other noteworthy groups of collaborators such as Support Staff (7%) and Deans/Associate Deans (5%), suggesting that principle grant holders involve a diverse group of collaborators in their grant projects.

Section 5: Project Dissemination Results

Every year grant recipients are required to report on dissemination of their project results. Although some 2017-2018 grant recipients and all 2018-2019 recipients have not yet submitted reports, available information from the existing 136 reports show that grant recipients, in general, tend to disseminate project results at national and international conferences.

As is indicated in Figure 10, grant recipients have disseminated their project results via 149 conference presentations, 43 local presentations, and in 39 publications from 2014 to 2018. Many grant recipients further disseminate their results through publications following completion of their grants, which is not captured in their final report. Conferences are utilized more than local presentations and publication for the dissemination of project results. Grant holders have disseminated their project results in both national and international conferences. For instance, Beth Archer-Kuhn from the Faculty of Social Work presented her project findings first at the Canadian Association of Social Work Education in Calgary in 2016 and then at the NAFSA Annual Conference in Los Angeles, California in 2017. Some grant holders have presented their findings in conferences beyond North American countries. Daphne Kennedy, a member of the Faculty of Nursing, presented at the International Conference in Nursing in Barcelona, Spain. Brittany Harker-Martin from the Werklund School of Education disseminated her project results at the World Educational Research Association World Congress in Cape Town, South Africa. In sum, grant holders have put considerable efforts towards developing their grant projects and presenting their project results through diverse conferences at national and international levels.

FIGURE 10. DISSEMINATION RESULTS, BY YEAR (2014-2017)
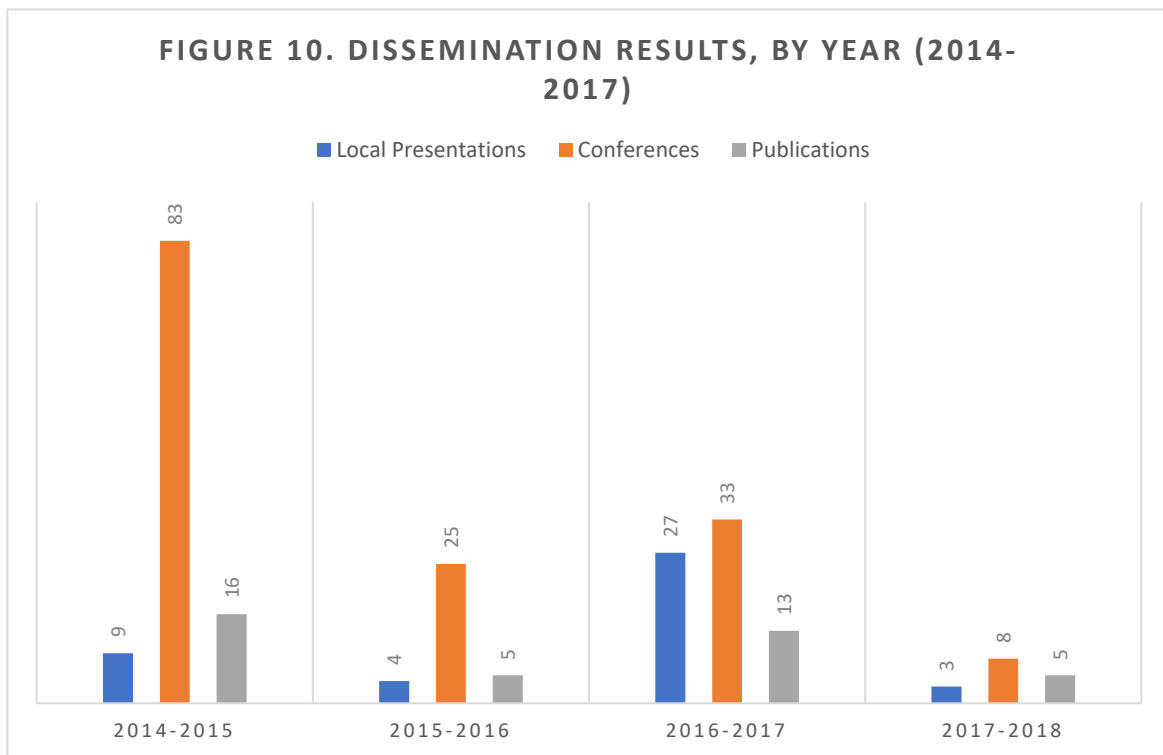
Section 6: Summary of Impact

Learning is the process of creating knowledge (Austin & Rust, 2015, 194). The Taylor Institute for Teaching and Learning (TI) is dedicated to fostering learning through the creation of knowledge at a grassroots level here at the University of Calgary, through national and international collaborations, and through global knowledge-sharing. Over the past six years, support from the Provost's Office has resulted in a total investment of $1.36 million of grant funding used to support 190 peer-reviewed research projects.

The University of Calgary Teaching and Learning Grants Program has supported students and faculty in collaboration with community and industry. They have generated a broad and exciting scope of new knowledge focused on achieving higher level learning, innovative partnerships between industry and academia, and development of sustainable best practices in learning environments and beyond. This Summary of Impact is intended to demonstrate the scope of work supported through the Grants program.

This report cannot possibly span the entire intellectual terrain covered by all 190 funded projects and their collective impact. The goal of this report is to provide an overview of a broad, diverse, and innovative body of knowledge geared toward improving learning environments and implementing evidence-based learning technologies. While 190 projects have been funded, many remain works in progress. All grant recipients are asked to provide reports. Due to outstanding reports, and to the ongoing reporting cycle, 84 reports (77 final reports, 3 interim reports, and 4 applications) were consulted for this summary.

Phase one of this analysis included reviewing final reports and coding content into emergent themes. Phase two of the analysis included a review of coded content and selection of projects for inclusion in this report. The examples selected take into consideration a desire to represent project diversity across faculties, grant streams, project type, generated impact/results/knowledge creation, and annual time frames. The selected projects, quotes and examples are intended to provide an overview of the scope of grant-funded research. The content is further organized into the following topic areas selected to represent some common themes related to the type of impact generated through the research: Knowledge Creation on a Global Scale, Focus on Student Learning and Well-being, Experiential Learning, Learning Technologies, and Ripple Effects.

Theme Summary:

Knowledge Creation on a Global Scale

Research facilitated through the University of Calgary Teaching and Learning Grants Program is situated in the global research community driving the Scholarship of Teaching and Learning (SoTL). The Provost's Office, in support of the TI, plays a leadership role within this global community and forges development of an intellectual hub that fosters local, national, and international knowledge exchanges.

[Our] research was one of 12 Doctoral Reports worldwide to be presented at the prestigious Association for Medical Education Conference (AMEE 2018) in Basel, Switzerland (Anderson et al., 2018, August).

Focus on Student Learning and Well-being

Funded projects contribute to goals that maximize student learning potential, support student health and well-being, improve the student experience, and deliver sustainable high-quality education. The Grants Program provides resources needed to reach these goals.

"One of the beautiful pieces of inquiry-based learning is that the professor is in the trenches with us doing the learning with us and reflecting questions back to us… Instead of being the knowledge keeper they are being a knowledge translator" (Archer-Kuhn et al., 2017).

Experiential Learning

Extensive research shows the value of learning by doing (Austin & Rust, 2015). Experiential learning can include paid co-operative education programs, internships, community service learning, practicums, field placements, applied research and research projects, lab or field settings, and international study or work opportunities (Office of Experiential Learning, n.d.).

"Our research demonstrates that our pedagogy is significantly improving the seven skills of entrepreneurial thinking, including problem solving, empathy, and team dynamics."
- Instructor, Houston Peschl

Learning Technologies

State-of-the-art technologies have been implemented in many UCalgary programs through support from the University of Calgary Teaching and Learning Grants Program. Learning technologies create created educational experiences designed to optimize learning, produce graduates with competitive skill sets, and set the stage for successful careers.

"The rapid emergence of learning technologies is transforming how contemporary students and professors communicate, in physical and virtual spaces, to enhance teaching and learning."
- Associate Professor, Dr. Linda Duffett-Leger

Ripple Effects

The collective impact of the University of Calgary Teaching and Learning Grants Program includes contributions to teaching and learning innovation on a global scale, and the creation of interdisciplinary partnerships, knowledge exchanges, and development of knowledge networks.
"By incorporating these tools into my teaching and to others' teaching, it has helped thousands of students improve on their learning and development as well as equip them with attributes and skills needed for jobs post graduation."
- Dr. Thomas O'Neill

Knowledge Creation on a Global Scale

Research facilitated through the University of Calgary Teaching and Learning Grants Program is situated in the greater context of a global research community where a shared interest in enhancing student learning drives both the Scholarship of Teaching and Learning (SoTL) and teaching and learning research more generally. The Provost's Office, in support of the TI, is honoured to play a leadership role within this community of scholars and to forge the development of an intellectual hub that fosters local, national, and international partnerships.

At the same time, we acknowledge a great responsibility to support student researchers through development of research skills and creating opportunities to participate in knowledge production. In striving toward excellence in research, the University of Calgary Teaching and Learning Grants Program facilitates solution-based knowledge creation that propels superior teaching and learning practices, innovation in industry, and sustainable practices. The following projects exemplify how funded projects contribute to knowledge creation on a global scale.

Neuro-educational Breakthrough in the Study of Learning

SoTL research, funded through the grants program, was recently recognized at a prestigious medical conference in Basel, Switzerland. The interdisciplinary work of Cumming School of Medicine PhD student Sarah Anderson, brought together a team of experts that included researcher and medical educator Dr. Heather Jamniczky, a health professions educator and measurement specialist, Dr. Kent Hecker, a neuroscientist with expertise in learning, Dr. Olave Krigolson, and a medical education researcher, Dr. Sylvain Coderre. Anderson's research was selected as one of 12 Doctoral Reports worldwide to be presented at the 2018 Association for Medical Education Conference (AMEE 2018) (Anderson, Jamniczky, Krigolson, Coderre, & Hecker, 2018, August).

"This research is one of the first applications of neuroimaging to provide empirical quantitative evidence to inform best practices in 2D and 3D teaching and learning in health professions education," says Dr. Anderson (2019). The team's ground-breaking research uses electroencephalographic (EEG) measurement of brain activity to track a student's acquisition of knowledge throughout the process of learning. The researchers sought to determine what virtual learning environment best supported knowledge retention in students learning anatomy. "A key knowledge gap in the field of health professional education was the lack of understanding of how the brain processes and interacts with information from spatially presented content," explains Dr. Anderson (2019). The team discovered that learners experience stronger knowledge retention through combined use of 2D and 3D images (NPJ Science of Learning, 2019).

The findings of this research have been published in the *Nature Partner Journal – Science of Learning*, *Frontiers in Human Neuroscience*, and *Medical Science Educator*. Dr. Anderson was selected as a finalist for the Education Research Platform Presentation Award at the American Association for Anatomy (AAA) conference in April 2019, and she also received "Best Poster Award" at the international SIG 22: Neuroscience and Education Meeting in 2016. Dr. Anderson is the recipient of a Social Sciences and Humanities Research Council (SSHRC) Doctoral Fellowship, and an Alberta Innovates Health Solutions (AIHS) Graduate Studentship.

The SoTL grant-funded contributions of this project will inform educators across disciplines where spatial representation of objects is key to learning.

Science in the Making – A UCalgary-based Solution to an International Learning Gap

UCalgary geoscience instructor Dr. Glenn Dolphin noticed there was an international shortage of science-based case studies in three major international repositories. He approached the University of Calgary Teaching and Learning Grants Program with a student-centered idea. "Of the over 600 cases in these repositories, only about 20 are geoscience related, and none deal with plate tectonics - the theory of the earth," he reported. "This presents a niche that that can be filled at the University of Calgary" (Dolphin, Burylo, Hurst, Weibe, & Petryshen, 2014).

Dr. Dolphin assembled a team of student research assistants (RAs) and began the process of developing seven geology-focussed historical case studies for use in UCalgary classrooms, across Canada, and internationally. "The structure set up in each of the cases engages students by placing them 'in the history' of an idea," says Dolphin. Students created inquiry-based narratives on topics such as *What Killed the Dinosaurs?* and *Earthquakes and Mountain Building* (Dolphin et al., 2014). Included in each case study are experiential activities such as constructing continental puzzles, working with an earthquake machine, and building stratigraphic cross-sections.

This project generated knowledge both in the form of needed niche case studies, and through documenting the process of developing case studies using student researchers. Findings related to this research have been presented extensively at UCalgary and elsewhere in Alberta, as well as in British Columbia, California, Minnesota, Nevada, Maryland, New York, and Brazil. Content based on these case studies was published in the *Journal of Geoscience Education.* This collection of geoscience-specific case studies is now published online and available to educators internationally (Dolphin et al., 2014).

Focus on Student Learning & Well-being

Within the context of striving for excellence in an international research community, the University of Calgary Teaching and Learning Grants Program prioritizes students. Funded projects contribute to goals that maximize student learning potential, support student health and wellbeing, improve the student experience, and deliver sustainable high-quality education. The University of Calgary Teaching and Learning Grants Program provides resources needed to reach these goals.

Grant-funded projects find solutions to learning challenges. A project led by UCalgary Werklund School of Education faculty members addressed Intercultural Rhetoric (IR) problems by pinpointing six ways instructors can support students from diverse cultural backgrounds improve their academic writing (Bhowmik, Sengupta, Chaudhuri, Tweedie, Kim, Liu, & Amery, 2016).

Another Teaching and Learning grant afforded studies of the impact of late banks in online graduate classes that allow students to access a "late bank" of limited, flexible due date options to alleviate stress. Students reported using the late bank to balance competing demands of other course work in response to unexpected situations such as illness and family emergencies, and to maintain responsibilities outside of coursework related to school-life balance (Schroeder, Makarenko, & Warren,

2019).

Other grant recipients have implemented new teaching and learning tools such as peer feedback and team dynamics software to support team-based professional skills (O'Neill, Eggermont, Rosehart, Brenna, & Hugo, 2014) and concept maps to help geomatics engineer students master complex concepts (Rangelova, O'Keefe, Hassan, & Detchev, 2017).

Grant project research has refined pedagogy (Hall-Beyer, Draper, Sjogren, Freeman, Rettie, Williams, Miller, & Blue, 2014), assessed learning outcomes (De la Hoz Siegler, Sumon, Asili, Motazedi, & Ujan, 2017), and designed and redesigned courses to meet emerging needs (Archer-Kuhn, Lee, Wright, Finnessey, Liu, Abrams, Vogler, & Kabano, 2017; Drolet, 2015; Peschl, Hassey, Hoffart, Larson, Grocott, & O'Neill, 2014). The following examples exemplify how UCalgary faculty are using grant funds to improve student learning experiences and meet the needs of future professionals.

Empowered Learning Through International Travel and Inquiry

"Deep learning is possible…and empowering," say Dr. Beth Archer-Kuhn and Dr. Yeonjung Lee (Archer-Kuhn et al., 2017). This insight comes following an intensive two-year study on student engagement that took the two social work faculty members to three cities in Great Britain with a study group (Archer-Kuhn & Lee, 2016).

The research team conducted a mixed methods evaluation of the inquiry-based learning (IBL) activities designed around a 15-day study tour course. IBL helps students be more active in their learning through self-directed inquiry (Blessinger & Carfora, 2014) and can be a challenging shift for students. "I think most of us, wherever your education was from, there's this conventional way of teaching," says one student. "Some of us sometimes might have been frustrated with the process because we feel like we need to be led and we're not used to having that control" (Archer-Kuhn et al., 2017).

Students experienced two learning phases. Prior to international travel the group participated in a structured controversy experiential learning process. During the 15-day tour of Glasgow, Belfast and London, the group engaged in IBL (Archer-Kuhn & Lee, 2016). "One of the beautiful pieces of inquiry-based learning is that the professor is in the trenches with us doing the learning with us and reflecting questions back to us when we are asking question[s]," says another student. "Instead of being the knowledge keeper they are being a knowledge translator" (Archer-Kuhn et al., 2017).

Pre- and post-course measurement showed students increased their higher-order learning, with a significant increase in reflective and integrative learning after participating in IBL. "Learning can in fact take place without the usual power differentials that exist between faculty and student and rather in an environment where students and teachers are partners and collaborators" (Archer-Kuhn et al., 2017).

Knowledge created during this project has been shared in peer-reviewed conferences in Calgary, Los Angeles, Halifax, and Regina. Related to this work, research symposiums on IBL were facilitated at UCalgary and in partnership with Dr. Stacey MacKinnon at the University of Prince Edward Island. Dr. Archer-Kuhn and Research Assistant Savannah Finnessey were invited to present at the TI. The research team also presented a Lunch and Learn in the UCalgary Faculty of Social Work. Team members have submitted three manuscripts to peer-reviewed journals with one currently in press (Archer-Kuhn, Lee, Finnessey, & Liu, in press). Unpublished manuscripts include an inquiry-based resource manual for

educators and a group study program template that can be used across disciplines (Archer-Kuhn et al., 2017).

Schulich School of Engineering Develops New Tool to Measure Concept Learning

Dr. Hector De la Hoz Siegler and Dr. Kazi Sumon wanted to measure retention in learning of chemical engineering students by the time they reached fourth year. To find out what key concepts needed to be taught in a different way or required further reinforcement, Dr. Siegler and Dr. Sumon developed a concept inventory. "The test developed in this project provides a tool to test the effectiveness of teaching interventions and learning activities and in this way is similar to a GPS that tells us where we are and how far we are from [where] we want to be," (De la Hoz Siegler et al. 2017).

Using the new tool, De la Hoz Siegler et al. redesigned learning activities around key concepts that were still unclear. "Activities that require students to think on interactions, consequences, and where they are required to apply their newly acquired knowledge and skills to an unfamiliar setting or problem situation are more likely to cause a permanent connection in the students brain and result in long term learning" (De la Hoz Siegler et al., 2017).

Dr. Siegler and Dr. Sumon presented on this research at the SSE Engineering Education Forum in Calgary, and the XXIX Interamerican Congress of Chemical Engineering in Toronto.

Meeting the Learning Needs of Tomorrows Professionals

Dr. Julie Drolet wanted to better prepare students to meet the needs of a rapidly changing world. "The impacts of climate change, disasters, poverty, unemployment, disparities in wealth, violence, and gender inequities, among others, contribute to a new imperative to prepare social work students to address these interrelated concerns, and their effects, on diverse populations," says Dr. Drolet (2015).

A Practice Grant allowed Dr. Drolet to conduct an extensive literature review on teaching approaches that address complex, interrelated and systemic problems. The findings informed curriculum design for a new course that combined participatory and interactive learning using individual and group mind-maps, case studies, and connections with community-based agencies. "Practitioners were invited as guest speakers to facilitate student understanding of the potential roles of social work in sustainable social development practice," says Dr. Drolet. The new course fills a gap in course content related to the emergence of green social work with a focus on sustainable practices and issues outlined in the Global Agenda (Drolet, 2015).

Experiential Learning

Experiential learning is an important area of scholarship within teaching and learning. Over the past three decades, extensive research has evolved highlighting both the value of learning by doing in non-traditional learning environments (Austin & Rust, 2015), and best practices for implementation of experiential learning (National Society for Experiential Education, n.d.). Experiential learning can include paid co-operative education programs, internships, community service learning, practicums, field placements, applied research and research projects, laboratory or field settings, and international study or work opportunities (Office of Experiential Learning, n.d.).

The following examples provide a sampling of exceptional UCalgary experiential learning projects with wide reaching impacts.

Faculty Develop Intellectual Hub for Field School Improvement

Geography field schools are rapidly evolving through integration of innovative experiential learning strategies. This project began as a reconfiguration of Geographic Field Studies (GEOG391) – an off campus residential program in operation since 1998. Faculty members wanted enhancements that would centre on experiential learning methods.

A team of eight faculty members began an extensive collaboration with each other, with students, and within an international community of geographers. "Co-recipients of the teaching and learning grant were able to bring together a tremendous array of geographers and cognate disciplines from around North America and Europe to discuss their experiences, methods, and challenges in running international field programs," report Drs. Mryka Hall-Beyer, Dianne Draper, Darren Sjogren, Andrea Freeman, Kathy Rettie, Aaron Williams, Byron Miller, and Gwen Blue. Information exchange included consultations with universities offering comparable programs, data collection through a student questionnaire, and conference participation/presentations in Calgary, Chicago, Boston, and San Francisco (Hall-Beyer et al., 2014).

The final result for GEOG391 was an integration of a thematic experiential approach that connected larger themes to individual modules, projects, and student observations in the field. The intended results of this grant, however, expanded well beyond GEOG391. Members of the team documented the implementation process which now has supported similar processes in other field courses.

In addition to the results noted above, a new Calgary water resources field module was piloted by Dr. Draper and Dr. Williams as a joint meeting of their respective GEOG 421 (Renewable Resources and Natural Environments) and GEOG 521 (The Urban Environment) courses. Similarly, Dr. Draper and Dr. Rettie employed photo essay assignments in two Canadian field schools, and Dr. Hall-Beyer contributed two chapters to a book on geographical information systems. Extensive knowledge sharing resulted locally, nationally and internationally through participation and presentations at conferences and formal publication. Finally, Dr. Williams was awarded the University of Calgary Teaching Award for Experiential Learning for 2017.

"We continue to develop a national/international ongoing exchange of scholarship [with] surrounding field schools and travel schools as they integrate various sub-fields of geography," the team concludes. "This goes beyond the immediate project, but conferences and other collaborative activities under the grant have established a community of practice aimed at integrating the various aspects of geography in student field experiential learning" (Hall-Beyer et al., 2014).

Experiential Learning in Partnership with Alberta Children's Hospital

Learning through simulated experience is particularly effective for teaching procedural skills to healthcare professionals. For more than a decade, medical professionals have honed life-saving professional skills through the Pediatric Inter-Disciplinary In-Patient Staff Simulation Education (PRISE) Program at Alberta Children's Hospital. "It makes me better at what I do, that's for sure," one

participating medical doctor says. "Especially with an acute deteriorating patient. The skills I've gained are very transferable to our real-life situations" (Cooke, Hall, Cheng, & Ragan, 2015).

As part of the University of Calgary Teaching and Learning Grants Program, Dr. Suzette Cooke, Dr. Sarah Hall, Dr. Adam Cheng, and Lily Ragan undertook a comprehensive evaluation of PRISE. 241 doctors, nurses and respiratory therapists who participated in PRISE sessions were surveyed, in addition to focus groups that were conducted with participants. The purpose of the evaluation was to determine the program's effectiveness, and to consider the potential for expanding PRISE-based learning to Cumming School of Medicine students.

"Simulation is one of the most relevant ways to continue to facilitate learning in practicing medical professionals," explains Dr. Suzette Cooke, the principal investigator for the research project. "Health care professionals have a strong desire to continue to learn through-out their career and prefer to learn in applied settings that simulate the real-life settings and context in which they work. PRISE was designed to help create this type of learning environment and this research helped us to evaluate the impact of the PRISE program. We discovered that participation in PRISE promotes the discovery of new knowledge and skills, supports the practice and refinement of previously learned skills, and facilitates interdisciplinary teamwork and collaboration. Simulation also provides learners with an opportunity to participant in scenarios without risk of harm to the patient and be exposed to a mix of topics to address their learning needs" (2019).

The evaluation resulted in valuable insights in three key areas. First, interprofessional curricula that meets the needs of both students and professionals across disciplines is highly valued among medical professionals. "In PRISE, we get to work through how we can best communicate together and lead codes," said one doctor. "Developing that shared mental model, how we speak and how we listen. I think that's really integral and simulation is, bar none, probably the best place to be practicing that."

Second, lifelong learning is essential for both students and professionals in clinical practice. "I find that it (PRISE) makes me think outside the box," says a nurse participant. "PRISE changes my practice in terms of understanding the potential for a case to become a code and preparing myself … if this was going to happen, how we can go about it."

Finally, the evaluation concluded that PRISE-based learning could be embedded into both didactic classroom teaching and bedside teaching. In response to these findings, plans were made to integrate six PRISE-based learning components into learning venues for UCalgary medical students and residents (Cooke et al., 2015).

Developing the Next Generation of Business Leaders

In 2014, a University of Calgary Teaching and Learning Program grant helped a successful Alberta Entrepreneur design an experiential learning environment that would train second year business students to recognize innovative opportunities and grow their entrepreneurial skills. Haskayne School of Business Instructor, Houston Peschl, forged a partnership between the Hunter Centre for Entrepreneurship and Innovation and the Department of Psychology Individual and Team Performance Lab to create a new course unlike anything previously taught in a traditional business classroom: Entrepreneurial Thinking 317.

"This course will develop leaders and critical thinkers who can creatively find solutions, learn from their failures, and find innovative market opportunities for today's global challenges", says Instructor Peschl (Peschl, H., Hassey, D., Hoffart, G., Larson, N., Grocott, K., & O'Neill, T., 2014). Peschl et al. created a series of interactive video case studies featuring candid interviews with successful local entrepreneurs and thought leaders. The use of digital content focused on creating awareness around an entrepreneurial mindset driven by curiosity, creativity, passion, and persistence – best demonstrated through conveying the business leader's own words and thinking process.

The curriculum included a series of hands-on learning tasks starting with a design thinking methodology workshop. Students worked through complicated problems, accessed subject matter experts, and engaged with business mentors to develop business concepts. The course culminated with an RBC Fast Pitch Business Model Competition where the top team received $50,000 to develop their idea.

"Our research demonstrates that our pedagogy is significantly improving the seven skills of entrepreneurial thinking, including problem solving, empathy, and team dynamics," says Instructor Peschl (2019). Most students found the course to be "more inspiring, involved, and interesting compared to other courses" and there was "a high degree of satisfaction, perception of learning, and engagement" (Peschl et al., 2014).

A subsequent TI grant helped facilitate creation of the *Failing Forward* Open Educational Resource (OER). Students now have free access to course content, exercises, and assignments. "This OER is now being used around the world by other instructors and students, with the aim of collaborating to improve the content," says Instructor Peschl. Peschl et al. have also presented their research on teaching entrepreneurial thinking internationally at scholarship of teaching and learning conferences (2019).

ENTI317 is currently taught to 800 business students and has led to a dozen who have started companies (University of Calgary, n.d.).

Learning Technologies

"The rapid emergence of learning technologies is transforming how contemporary students and professors communicate, in physical and virtual spaces, to enhance teaching and learning," says Associate Professor Dr. Linda Duffett-Leger (n.d.). Grant funding allowed Dr. Duffett-Leger to develop and test technologies to support team-based learning (TBL) that would build critical thinking skills and engagement in undergraduates.

A Practice Grant also helped the School of Performing Arts explore technology to augment deeper engagement for large lecture classes. Dr. Patrick Finn and Anton Degroot, MFA (Finn & Degroot, 2014) explored online learning, flipped classrooms, media support, and audio and video podcasts. They developed and implemented a template for multimedia and multiplatform teaching materials using existing hardware and software to create new avenues for students to engage with course content. The framework also provides increased accessibility for students with visual or hearing impairments. The template created through this project is now available for use for by faculty across

UCalgary.

Three faculty members from UCalgary's Werklund School of Education explored how various forms of interaction in online doctoral courses impact student engagement. Dr. Michele Jacobsen, Dr. Gale Parchoma, and Dr. Marlon Simmons found that interaction in online courses that included both synchronous audio discussions and asynchronous text-based discussions appear to positively impact student engagement and that mature learners in particular benefit from using multiple modes of communication (Jacobsen, Parchoma, Simmons, Nelson & Bhola. 2015).

Creative educators are using technology to achieve higher learning outcomes (Ferrer, Shaw, Lorenzetti, Cruz, & Wright, 2018), improve engagement (Duffett-Leger, n.d; Finn & Degroot, 2014; Jacobsen et al., 2015), increase access to education through virtual learning spaces (Duffett-Leger, n.d.) and explore unique collaborations to integrate technology into their curriculums (Ferrer et al., 2018).

A unique SoTL collaboration - the Faculty of Social Work and CJSW 90.9 FM - brought social work to community radio. Dr. Ilyan Ferrer, Dr. Jessica Shaw, and Dr. Liza Lorenzetti found that "disrupting …traditional forms of teaching through podcasting allowed us to engage in a more experiential form of teaching and learning." Student-led podcasting helped undergraduates develop professional social work identities, engage in critical reflection about course content, and foster engagement between UCalgary and the community (Ferrer et al., 2018).

State-of-the-art technology has been implemented in many UCalgary programs through support from the University of Calgary Teaching and Learning Grants Program. The following project demonstrates how the integration of learning technologies has created a state-of-the-art educational experience designed to produce graduates with competitive skill sets and set the stage for successful careers.

Partnering with Industry Produces State-of-the-Art Learning with Augmented Reality

The W21C Research and Innovation Center for health systems research, and Innovate Calgary, UCalgary's Life Sciences Innovation Hub, set out to design a better way to teach central venous catheterization – a common medical procedure used to administer medication, blood products, or fluids. A team comprised of Dr. Irene Ma, Julie Babione, David Borkenhagen, Greg Hallihan, Pierre Wijdenes, and Rose Geransar brought an innovative idea and the medical and intellectual property expertise needed to Scope AR – an augmented reality (AR) tech company (Ma, Babione, Borkenhagen, Hallihan, Wijdenes, & Geransar, 2014).

Together, they developed AR software that is fully embedded with instructions to walk learners through a step by step training protocol that is superimposed on a partial task simulator. The resulting prototype was extensively evaluated and revised to improve interface design, workflow, clinical content, virtual object and real-world relationship, hardware and software design, and audio and speech recognition. The final product gives students access to a complete training package which they can work through at their own pace.

"The result[ing] education is learner-centric, and the tool can result in time saved on instructions," explains Principal Investigator Dr. Irene Ma. The multi-modal nature of AR technology

means consideration of the optimal method of information delivery is inherent in the development of the product. "This project allowed our team to gain insight about the interactions of multi-modal teaching and how to better manage visual, tactile, and audio information simultaneously," says Dr. Ma. "As a faculty, while previously I was not as appreciative of the cognitive load imposed upon learners when redundant information is presented in dual modes, the difficulty in managing this cognitive load is more apparent in an AR environment" (Ma et al., 2014).

This project sets precedent within W21C for co-development of a product using a shared intellectual property (IP) model through an agreement facilitated by Innovate Calgary. "Through our usability testing, we have developed a framework for heuristic evaluation for augmented reality that can be applied to integrations of future AR products," concludes Dr. Ma. The project was accepted as a Case Study at the international 2018 ACM CHI Conference on Human Factors in Computing Systems in Montreal.

Ripple Effects

Each funded project creates direct impact through the results it produces, as demonstrated in this report. Ultimately, research facilitated by the University of Calgary Teaching and Learning Grants Program improves the learning experience of students, as articulated by a UK Study Tour participant supported through Dr. Beth Archer-Kuhn's 2016 SoTL Collaborative Grant: "This learning process had me engaged with the content, while also causing me to think about linkages with previous knowledge, theories and concepts and challenging me to think beyond my own cultural and social programming" (Archer-Kuhn et al., 2017).

"I've been working and will continue working on redesigning the activities that I perform in the classroom in order to find those that result in a more effective learning", says chemical engineering Assistant Professor Dr. De La Hoz Seigler (2017). The ongoing benefits of integrating continuously improved teaching methods into UCalgary classrooms and programs has long-range impacts to students and society, as articulated by another grant recipient. In partnership with the Dean's office of the Schulich School of Engineering and Dr. Melissa Boyce from the Department of Psychology, Dr. Thomas O'Neill implemented and tested an automated peer evaluation system designed to improve teamwork and communications skills. "By incorporating these tools into my teaching and to others' teaching, it has helped thousands of students improve on their learning and development as well as equip them with attributes and skills needed for jobs post graduation" (O'Neill et al., 2014).

The University of Calgary Teaching and Learning Grants Program has also provided valuable work experience for students in paid positions. "Participation as a research assistant has had a positive impact on me as a developing academic, a researcher, and as an individual," says one student. "I learned to collaborate with other academics to achieve set goals, got the opportunity to work on the literature review, to do in-depth data analysis, to prepare for and co-present at conferences, and to be a note taker at a symposium" (Jacobsen et al., 2015). Another student says, "As a member of a research team, my experience on the project reinforced my understanding that I do not necessarily need to possess expertise in all elements of a project for the project to be a success, and that collaborations involving individuals with varying areas of expertise present unique problems that serve as opportunities for learning" (Parker, Benzies, Caird, Simmons, & Rutherford, 2017).

Research supported by the University of Calgary *Teaching and Learning Grants Program* is disseminated locally, nationally, and internationally through presentations at conferences, published manuscripts, papers, posters, online resources, podcasts and digital mediums (videos, podcasts, blogs, internet publications). Contributions to teaching and learning research have forged connections between UCalgary and other learning institutions around the world. The full impact generated by such a massive scope of shared knowledge can only be speculated. However, it is important to consider that the collective impact and ripple effects of the University of Calgary Teaching and Learning Grants Program supported knowledge includes:

- Contributions to teaching and learning awareness and innovation on a global scale.
- Creation of interdisciplinary partnerships and knowledge exchanges.
- Development of academic and professional knowledge networks.

The research results generated through the University of Calgary Teaching and Learning Grants Program have potential to span much beyond the university community for application in industry, education (primary, secondary and post-secondary), and community organizations.

The University of Calgary Teaching and Learning Grants Program provides the resources needed to foster a teaching and learning culture ever motivated to achieve higher educational outcomes. It provides a structured approach for both students and faculty to contribute to the application of evidence-based learning approaches in UCalgary learning environments and beyond. Ongoing grant allocation provides continuous opportunity to rethink how we teach and how we learn – from many perspectives - ultimately, building better learning.

Section 7: Recommendations

As a result of this review, the *Taylor Institute for Teaching and Learning* puts forward the following recommendations for improvement:

1. **Remove Lesson Study Grant Stream as a stream.** This stream has resulted in the fewest number of grants funded. This option should be made available through the SoTL stream.

2. **Expand the Development and Innovation Grants stream to include Open Educational Resources (OER).**

3. **Continue to involve students as partners in grants.** It is a positive way to engage students in the teaching and learning community, and foster reciprocal knowledge sharing and development.

4. **Expand support for under-represented units.** This includes faculties such as the School of Architecture, Planning, and Landscape, Law, and Kinesiology.

5. **Ensure a public abstract is included in reports on all grant projects.** This will ensure that the TI maximizes the dissemination of project results in order to facilitate integration of research evidence into teaching practice at the University of Calgary and beyond.

6. **Emphasize a desire for more local presentations and avenues for dissemination**. Continue to encourage dissemination at local, national, and international levels. Implement a bi-annual survey of grant recipients post-receipt to assess further impact and dissemination.

7. **Develop a digitally managed acceptance process for Interim and Final Grant Reports.** This will allow clarity and streamlining in the submission and adjudication process.

8. **Ask grant recipients to specify which team member(s) authored the interim and final reports.** This will provide clarification for future use in Taylor Institute reporting.

9. **In addition to Mid-Term and Final Reports, conduct post-grant evaluations**. This will help capture the outcomes and ripple effects of the grants program that often extend beyond the funding period.

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