THE UNIVERSITY OF BRITISH COLUMBIA

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UBC Vancouver Senate Undergraduate Research Working Group

The Undergraduate Research Working Group, a working group of the Senate Teaching and Learning Committee, explores and pursues ways to improve the UBC student academic experience via undergraduate research. Strategy 8 of UBC's new strategic plan, *Shaping UBC's Next Century*, focuses on broadening access to, and enhancing, student research experiences. A key part of this strategy is concentrating efforts on enriching the access to undergraduate research, which will improve the student experience by deepening undergraduate students' academic learning and strengthening their post-graduation success.

The dissolution of UBC's Undergraduate Research Office in 2010 was intended to provide more autonomy to Faculties in directing their own resources and creating Faculty-based Undergraduate Research Offices. However, without definitive requirements or goals, no implementation was realized, though many faculties offer research-intensive courses. UBC offers International Service Learning courses and resources such as entrepreneurship at UBC (e@UBC), the Robert H. Lee Alumni Centre's Creative Destruction Lab and the Sustainable, Ecological, and Economic Developments Studies (SEEDS) program. Faculties, Work Learn, and the Tri-Councils offer several forms of funding for undergraduate research, and student-led initiatives, such as the AMS Club Undergraduate Research Opportunities (URO) and AMS eHub are also available.

Elsewhere, centralized undergraduate research opportunity programs and centres have allowed for widespread student and faculty participation, along with increased student retention and participation. The project based model has proven a low-barrier way to begin research.

Past UBC and AMS surveys provide evidence that the majority of undergraduate students attend UBC in part for the anticipated research experiences, and that nine in ten students find these opportunities important. However, only two in ten students agree that there are adequate channels to propose research projects. The majority of UBC students are looking toward graduate school and professional programs, and would greatly benefit from knowledge of and access to research opportunities.

By surveying students and participants along with allowing self-reporting channels, information to assess the quality of undergraduate research opportunities could be collected. To expand the number of undergraduate research opportunities available, knowledge communities can be created by pairing students with faculty members, graduate students, UBC staff, and industry members, allowing for increased capacity to meet unmet demand. A central research office would be the most feasible solution for implementing undergraduate research opportunities, allowing for interdisciplinary coordination and harnessing economies of scale. Funding could come from the University (i.e. Teaching and Learning Enhancement Funds (TLEFs) or Excellence Funding), tuition, strategic fundraising, and funds set aside for UBC's new strategic plan.

Looking forward, providing course-integration, transcript recognition, prioritizing teaching and research as incentives for tenure and promotion, and so much more could all work to expand access to undergraduate research opportunities. This working group's main priority will be to identify those opportunities for expansion, and eventually to help create implementation proposals.

Undergraduate Research: Current State Summary

1. DEFINITION OF UNDERGRADUATE RESEARCH

a. *"Research and research-equivalent opportunities shall refer to strictly academic pursuits that provide either a) an academic contribution to an area of research or to a discipline pertinent to one's field of study or b) a practical application of academic learning, with consequences for society."*[1]

2. PREVIOUSLY NOTED CONCERNS

a. Lack of effective data collection on research opportunities and experiences across campus

b. Students have difficulty finding and accessing research placements. This includes basic skill in knowing who and how to approach when interested in research.

c. Scalability of expanding research opportunities while maintaining high quality research mentorship with faculty members or graduate students.

d. Assessing the impacts and outcomes of research on students – we do this well in some areas and less well/not at all in others.

e. Scaffolding of experiences for both new first year and experienced upper year students

3. CONSULTATION FEEDBACK: Associate Deans, Academic and Research in Faculties[2]

- Increase student awareness of opportunities and watch for differences in uptake between domestic and international students.
- Find ways to support a range of research modes including course-based research and summer research opportunities (which we know work well), encouraging faculty to bring their research into the classroom, and non-traditional research.
- Consider how we prepare students for research, through training, building off of their undergraduate experience or introductions to the idea of research in their discipline (e.g. a quick talk/seminar on what research in a discipline looks like), to give students an idea of what to expect.
- Consider how research opportunities can sustainably be offered to all students (i.e. in terms of cost) and how quality can be maintained as class sizes grow.
- Value faculty and formally recognize their work as mentors. Recognition should also be included as part of faculty tenure and promotion process.
- Find ways to give students agency to pursue self-directed research in areas of interest. This is important to balance the reality that many current research opportunities are often quite prescriptive.
- Consider scalability of how to provide mentorship when the human resources of one PI are limited.
- Consider transcript recognition for students.

4. GENERAL RESEARCH RESOURCES AT UBC: Undergraduate research resources across UBC websites.

- Undergraduate Research Opportunities with Work Learn, NSERC USRA, WIURLA, and MURC: https://students.ubc.ca/career/campus-experiences/undergraduate-research-0
- Faculty of Science Research Opportunities: https://science.ubc.ca/students/resources/research
- Faculty of Arts Research Opportunities: https://students.arts.ubc.ca/involvement/research-in-arts/
- School of Kinesiology Research Opportunities: http://kin.educ.ubc.ca/research/student-opportunities/
- Undergraduate Research Opportunities (URO) Student Club: http://www.uroubc.ca/resources/

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[1] From UBC-Vancouver Senate Report on Undergraduate Research and Ad-Hoc Committee Proposal: Ad-Hoc Committee on Transforming Learning through Undergraduate Research and Research-Equivalent Opportunities, October 6, 2017. Submitted to Senate by Kevin Doering and Ian Sapollnik on behalf of UBC-Vancouver Student Senate Caucus.

[2] Consultation completed with the Associate Deans Academic and/or Research or designate with following Faculties: Applied Science, Arts, Commerce, Education, Land & Food Systems, Law, Medicine, Pharmaceutical Sciences, and Science.

- Canadian Journal of Undergraduate Research[3]: http://cjur.ca/
- Medicine Summer Student Research Program: https://science.ubc.ca/students/resources/research
- UBC Library's Open Collection of Undergraduate Research: https://open.library.ubc.ca/cIRcle/collections/undergraduateresearch

5. INTRODUCTORY RESEARCH EXPERIENCES

This brief focusses on a narrow definition of undergraduate research and we acknowledge there are many additional experiences through which students gain introductory research skills or undertake research activity through assignments or curricula. Below are two examples but there are many others across campus.

- **BIOL 140 – Laboratory Investigations in Life Sciences.** Guided experimental investigations of biological questions. Required for any student intending to major in a life science. Course includes a hands-on lab research project that students design and a field research component.

  "Students will participate in the scientific process, emulating as closely as possible the fundamental steps research scientists follow. The main goals of this course are for the students to:
  - *participate in the process of science and demonstrate scientific thinking.*
  - *acquire, organize, evaluate and integrate information about a biological system.*
  - *practice scientific skills by: making observations, asking research questions, designing and implementing an experimental protocol appropriate for their questions, using lab equipment effectively and efficiently, recording and analyzing data.*
  - *communicate orally and in a written form using the scientific explanation model and following format appropriate for biological journals.*
  - *work as part of a team to design, perform and communicate the results of their experiment."*[4]

- **PSYC 217 – Research Methods.** Required course for all BA, Psychology majors. Includes a Research Experiences Component (REC) assignment to introduce students to how research is conducted. The assignment can include engaging with a research study, analyzing a research article, or completing an online tutorial on the research ethics.

  "The purpose of this course is to help you develop the skills to be a critical thinker – both as a consumer of research, and a contributor to research. We will equip you with the knowledge and tools to critically evaluate research and ask the appropriate questions, create new ideas and design ways to test your ideas, analyse your data, and communicate your results to others. To facilitate this process, lab sessions are integrated into the course where you will work with your team to apply what you have learned in the classroom to a research project."[5]

[3] Founded by UBC students in 2015.
[4] Pulled from general course syllabi for BIOL 140 for Fall 2018: http://blogs.ubc.ca/firstyearbiology/files/2018/09/BIOL-140-SYLLABUS-Sept-2018-1.pdf
[5] Pulled from Dr. Benjamin Cheung's course syllabi for PYSC 217 for Summer 2018. https://psychology.sites.olt.ubc.ca/files/2018/06/217.pdf

6. EMBEDDING UNDERGRADUATE RESEARCH ACROSS THE DISCPLINE

There are also many programs where significant focus has been placed on undergraduate research within and across the discipline. These are strategic initiatives to widely embed undergraduate research across the program and curricula.

a) **Department of Microbiology & Immunology: Journal of Experimental Microbiology and Immunology (JEMI):** https://jemi.microbiology.ubc.ca/

- JEMI currently hosts four undergraduate research publications:
  1) An edited (non-refereed) journal of research articles on intermediate research results obtained by undergraduate students;
  2) A peer-reviewed (refereed) version of JEMI that invites international submissions of undergraduate research articles;
  3) JEMI-methods, a publication of written and video-based articles explaining the theory and application of techniques used in molecular, microbiology, immunology, and biochemistry;
  4) JEMI-PEARLS: a collection of hot-topic review articles written by undergraduate students in MICB 406.
- JEMI also includes an undergraduate research symposium for Microbiology and Immunology students and

b) Faculty of Medicine FLEX Courses: https://mednet.med.ubc.ca/Teaching/FLEX/Pages/default.aspx

- FLEX courses began in 2015 and offer students in their 1st, 2nd and 4th years of Medicine to pursue scholarly activity that is self-directed.
- In the first year, these include journal groups and a lecture series on the Foundation of Scholarship (FoS), followed by completion of a series of self-defined or previously selected learning activities.
- The Faculty of Medicine includes a repository of activities, from which a student can choose, which are submitted by faculty, organizations, and community practitioners.
- Students are grouped into small 8-student cohorts which are guided by an advisor who helps them develop their own learning goals, identify activities, and provide feedback.
- Showcase of student learning presented at a summative Flex Activity Day each year.

c) Department of Psychology: https://psych.ubc.ca/undergraduate/careers-involvement/get-involved/

- Department provides space online for advertising of research opportunities for students, as participants in Psychology research studies or as volunteer research assistants. Participation in a research study introduces a student at the most basic level, to the ways in which research studies are constructed and how research is undertaken with human subjects.
- The Psychology Student Association along with the department host the annual Psychology Undergraduate Research Conference (PURC)

d) Faculty of Arts Research Degree Requirement: https://students.arts.ubc.ca/advising/degree-requirements/writing-and-research-requirement/

- Students in a BA or BFA degree program are required to have a research intensive experience. They have identified specific disciplinary courses which meet the research requirement through an intensive research experience built into the curriculum.

7. UNDERGRADUATE RESEARCH BY THE NUMBERS

This is a summary of an environmental scan of the UBC Vancouver campus completed in Spring 2018. Below are examples of intensive and specific curricular and co-curricular undergraduate research offerings. Not included are the broad strategic efforts in departments or programs to embed important research activity within existing courses. Numbers for Work Learn and research programs are from administrative records while course enrolments have been pulled from the SISC.

a) Work Learn - Undergraduate Students in Research Oriented Positions <u>by Faculty/Program of student holding position</u>. The table below includes only the subset of all Work Learn positions that have been deemed research oriented.

Faculty of student in position	Domestic[6] (DOM) or International[7] (INTL)	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	TOTAL
Applied Science	DOM	17	13	9	22	28	89
	INTL	3	6	4	0	8	21
Arts	DOM	114	111	97	108	100	530
	INTL	12	13	14	11	35	85
Forestry	DOM	9	9	15	14	12	59
	INTL	5	7	10	2	5	29
Kinesiology	DOM	22	26	18	45	53	164
	INTL	0	2	2	0	2	6
LFS	DOM	23	24	21	32	27	127
	INTL	4	5	7	1	8	25
MED - Midwifery + Lab Science	ALL DOM	6	8	8	7	8	37
Nursing	ALL DOM	4	3	4	2	2	15
Pharmaceutical Sciences	ALL DOM	15	17	20	8	21	81
Other	ALL DOM	4	7	1	3	2	17
Sauder	DOM	16	19	17	11	9	72
	INTL	3	5	2	0	8	18
Science	DOM	192	234	188	274	269	1157
	INTL	19	20	11	5	38	93
TOTAL		**468**	**529**	**448**	**545**	**635**	**2625**
TOTAL INTL	**277**						
TOTAL DOMESTIC	**2348**						

[6] In all tables, this refers to students with VISA codes in SISC as Non-US International, USA Citizen, or Diplomatic Visa

[7] In all tables, this refers to students with VISA codes in SISC as Canadian, Permanent Resident, or Refugee

b) Work Learn - Undergraduate Research Oriented Positions by Faculty/VP in which the position is located. The table below includes only the subset of all Work Learn positions that have been deemed research oriented.

Location of Position by Faculty/VP	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	TOTAL
Applied Science	30	23	13	15	23	**104**
Arts	84	66	66	88	113	**417**
Forestry	15	29	26	22	16	**108**
Kinesiology/Education	5	22	23	26	22	**98**
LFS	20	15	23	28	35	**121**
Sauder	15	16	17	15	24	**87**
Science	105	118	78	83	72	**456**
College of Health Disciplines	5	2	3	3	7	**20**
Continuing Studies	11	4	1	0	1	**17**
Dentistry	8	7	2	7	6	**30**
Law	1	2	1	2	0	**6**
Medicine	155	205	178	236	269	**1043**
Pharmaceutical Sciences	0	2	3	4	7	**16**
Graduate Studies	0	1	0	0	0	**1**
VP Development & Alumni Engagement	2	1	1	3	5	**12**
VP Research	7	8	1	2	7	**25**
VP Students	3	5	7	6	3	**24**
VP Academic	2	3	5	5	18	**33**
VP External Relations	0	0	0	0	7	**7**
TOTAL	**468**	**529**	**448**	**545**	**635**	**2625**

c) Research Awards

		2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	TOTAL
Work Learn International Undergraduate Research Awards (WLIURA)[8]: All International Faculty is both the student and the location of the position	Applied Science	5	6	12	18	14	**55**
	Arts	16	16	13	38	34	**117**
	Forestry	2	2	7	5	9	**25**
	Kinesiology	1	1	2	3	2	**9**
	LFS	2	2	5	2	3	**14**
	Sauder	8	9	13	10	12	**52**
	Science	5	5	18	18	16	**62**
	TOTAL	**39**	**41**	**70**	**94**	**90**	**334**
NSERC USRA: All Domestic. This is the faculty of the placement, not the faculty of the student. Not all students are UBC students who hold these placements, but there will be some UBC students who hold placements at other institutions.	Applied Science (UBCV & UBCO)	59	54	49	48	48	258
	Arts	9	11	10	15	17	62
	Dentistry	1	1	1	1	1	5
	Education	0	0	0	0	1	1
	Forestry	12	10	10	12	10	54
	Kinesiology	6	9	8	6	6	35
	Land & Food Systems	8	13	6	11	6	44
	Medicine	16	25	25	38	39	143
	Pharmaceutical Sciences	0	0	1	2	2	5
	Sauder School of Business	3	5	4	5	4	21
	Science	92	99	96	95	99	481
	UBCO Health & Social Development	1	4	3	5	3	16
	UBCO Ike Barber School of Arts & Science	10	12	12	10	12	56
	TOTAL	**217**	**243**	**225**	**248**	**248**	**1181**
Arts Undergraduate Research Awards (AURA) (domestic/international)[9]		10/7	15/1	15/1	18/0	16/0	74/9
Science Undergraduate Research Experience (SURE) (domestic/international/other)		36/4/7[10]	46/4	46/0	42/4	41/9	211/21/7

[8] Faculty distribution is based on the percentage of the international student population in each faculty.

[9] Awards for international students have moved to the Work Learn International Undergraduate Research Awards which is why the number of international recipients has decreased over the past 5 years.

[10] There were 7 students for whom no citizenship information was recorded so these are noted as other.

d) Research Programs

Program Name	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	TOTAL
SEEDS[11]	737	643	532	892	755	**3559**
MURC - Number of Student Presenters (Oral or Poster)	108	190	283	233	207	**1021**
Research Abroad[12]	41	87	105	142	141	**516**
Community-Based Research[13]	1145	1559	1570	2473	1077	**7824**
Commerce Scholars Program[14]	11	11	12	11	6	**51**
Faculty of Medicine Summer Research Program	Approximately an average of 35 per year for non MD Students and 65 for MD students in their 1st or 3rd year.[15]					

[11] Include some graduate student participants. Actual total number of undergraduates in SEEDs placements is closer to 3100. Calculated using an average median for the 4 years of 87% undergraduate students.

[12] Includes Go Global structured research programs, student self-directed international research, and MITACS Globalink placements. Program summaries available at: https://students.ubc.ca/career/international-experiences/research-abroad

[13] Includes only activity through the Centre for Community Engaged Learning (CCEL), of both curricular and co-curricular nature which include one of the following forms of research activity: Literature reviews; scans of community assets, resources, organizations; information gathering for recommendations; knowledge generation; and data analysis

[14] Enrolment in COMM 311 (Commerce Scholars Program Research Methods course) used as a proxy number

[15] Taken from the Summer Student Research Program website FAQs: https://www.med.ubc.ca/current-learners/summer-student-research-program/faqs/

e) Course-Based Research[16,17]

Type of Course	Course Code	Domestic (DOM) or International (INTL)	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	TOTAL
Directed Studies Courses This data pull from SISC was for ANY student in a 448 in Summer or Winter Session.	448 (DS)	DOM	330	295	331	352	340	**1648**
		INTL	90	53	52	45	36	**276**
		SUB-TOTAL	**420**	**348**	**383**	**397**	**376**	**1924**
	433 (DS)[18]	DOM	16	20	19	30	17	**102**
		INTL	1	7	2	3	2	**15**
		SUB-TOTAL	**17**	**27**	**21**	**33**	**19**	**117**
	COMM 490 (DS)	DOM	9	19	10	18	22	**93**
		INTL	3	4	2	1	5	**15**
		SUB -TOTAL	**12**	**23**	**12**	**19**	**27**	**93**
	PHAR 405, 420, 414, 444, 453 (DS)	ALL DOM (No INTL)	33	32	55	38	79	**237**
Example Thesis- Based Courses	APSC 498 (TH), CPEN 499 (TH)	DOM	19	3	2	31	2	**57**
		INTL	2	1	0	6	0	**9**
		SUB-TOTAL	**21**	**4**	**2**	**37**	**2**	**66**
	APBI 499 (TH)	DOM	8	13	4	7	6	38
		INTL	0	2	0	2	0	4
		SUB-TOTAL	**8**	**15**	**4**	**9**	**6**	**42**
Example Directed Research Courses	449 (DR)	DOM	441	442	393	355	368	**1999**
		INTL	116	90	81	66	78	**431**
		SUB-TOTAL	557	532	474	421	446	**2007**
	MEDD 419 (FLEX)	ALL DOM (No INTL	N/A	N/A	290	288	291	**869**
	MEDD 429 (FLEX)	ALL DOM (No INTL	N/A	N/A	N/A	286	287	**573**
	MEDD 449 (FLEX)	ALL DOM (No INTL	N/A	N/A	N/A	N/A	N/A	**First cohort began in this course in Sept 2018**
		SUB-TOTAL	**N/A**	**N/A**	**290**	**574**	**578**	**1442**

[16] Other course codes not included but possibly with a research focus could include: ASTR 349 (DR), ASIA 499 (TH),FIPR 399 (DS), FNEL 482 (AR), CRWR 490 (DRead), ECON 492 (DRead), 499 (TH), FNIS 400(RSEM), FREN 498, (DRead), 499 (TH), GRSJ 450 (DS), ITST 495 (RSEM), POLI 492 (TH), PSYC 440 (DS), SPAN/FREN 495 (RSEM), FNH 497, FNH 499 (TH), FNH 425 (AR), APBI 496 (AR) , LFS 496 (AR), PHAR 410 (DR), KIN 499 (PRJ).

[17] Abbreviations used: DS – Directed Studies; TH – Thesis or Capstone Essay; DR – Directed Research; DRead – Directed Reading; AR – Applied Research; RSEM – Research Intensive Seminar; PRJ – Directed Project

[18] Includes Student Directed Seminars as this course code is regularly used for this purpose in SOCI.

8. RESEARCH EXPERIENCE SURVEY DATA

a) Undergraduate Experiences Survey, 2016.

The tables below show the interest & plans of **first year students** to participate in Enhanced Learning Opportunities, including research-based experiences (ELO plans/interest 1).

Enhanced Learning Opportunities - Plans & Interest

Please indicate your participation in the following while attending UBC.
*To learn whether new students plan on participating in each opportunity, or whether they have no interest, we suggest you select only "1st year" students using the "Year" filter on the right.

		Domestic	International
Plan to participate	Research-intensive experiences (senior research seminars, capstone seminars, honours seminars, advanced research projec..	23%	30%
	Community Service Learning Project	18%	28%
	Community Based Research	15%	25%
	International educational experiences (exchange, group study, service learning, study abroad courses, research placements, ..	40%	44%
Not interested in participating	Research-intensive experiences (senior research seminars, capstone seminars, honours seminars, advanced research projec..	19%	16%
	Community Service Learning Project	25%	17%
	Community Based Research	25%	21%
	International educational experiences (exchange, group study, service learning, study abroad courses, research placements, ..	16%	11%
Need to learn more to decide to participate	Research-intensive experiences (senior research seminars, capstone seminars, honours seminars, advanced research projec..	40%	34%
	Community Service Learning Project	47%	36%
	Community Based Research	51%	41%
	International educational experiences (exchange, group study, service learning, study abroad courses, research placements, ..	29%	25%

Enhanced Learning Opportunities - Plans & Interest

Please indicate your participation in the following while attending UBC.
*To learn whether new students plan on participating in each opportunity, or whether they have no interest, we suggest you select only "1st year" students using the "Year" filter on the right.

		Domestic	International
Plan to participate	Co-operative Education Program	53%	51%
	Field Research	25%	29%
	Practicum experiences	22%	21%
	Internships	50%	61%
	Work Learn experiences	42%	56%
Not interested in participating	Co-operative Education Program	12%	11%
	Field Research	22%	21%
	Practicum experiences	18%	17%
	Internships	8%	4%
	Work Learn experiences	7%	4%
Need to learn more to decide to participate	Co-operative Education Program	27%	23%
	Field Research	44%	37%
	Practicum experiences	53%	52%
	Internships	34%	22%
	Work Learn experiences	41%	27%

The tables below show the participation/ability to participate of **4th & 5th year students** in enhanced learning opportunities (ELO-Participate/Ability 2).

		Domestic	International
Have participated	Research-intensive experiences (senior research seminars, capstone seminars, honours seminars, advanced research ..	35%	40%
	Community Service Learning Project	16%	18%
	Community Based Research	10%	11%
	International educational experiences (exchange, group study, service learning, study abroad courses, researc..	18%	28%
Interested but unable to participate	Research-intensive experiences (senior research seminars, capstone seminars, honours seminars, advanced research ..	14%	12%
	Community Service Learning Project	15%	18%
	Community Based Research	15%	16%
	International educational experiences (exchange, group study, service learning, study abroad courses, researc..	36%	29%

		Domestic	International
Have participated	Co-operative Education Program	32%	25%
	Field Research	9%	16%
	Practicum experiences	8%	9%
	Internships	19%	25%
	Work Learn experiences	21%	28%
Interested but unable to participate	Co-operative Education Program	28%	31%
	Field Research	23%	24%
	Practicum experiences	23%	19%
	Internships	28%	28%
	Work Learn experiences	29%	32%