

a) Descriptive project title:

Student Podcasting as Project-Based Learning in Science Communication

b) Project summary:

This project employs student podcasting to examine how, and to what extent, creative project-based learning (PBL) contributes to the newly implemented UW Undergraduate Communications Outcomes (UCO). Students in SCCOM 100: Communication in the Sciences will work in groups to develop a podcast series of five weekly episodes that communicates scientific ideas to the general public. Assignment scaffolding will be provided by the instructor, along with workshops ensuring students have the necessary tools. However, projects will be student-led and will promote an advanced degree of the self-guided and collaborative learning that promotes deep learning; groups will make decisions on the theme and title of the podcast, the content, and the division of tasks amongst group members.

Developing this research as part of the newly implemented SCCOM 100, our aim is to examine and maximize the potential of PBL in achieving the UCO aims of comprehension, conceptualization, and contextualization.¹

c) Project goals/outcomes and, where applicable, research question(s) to be investigated:

This project aims to establish and investigate three general Learning Outcomes (LO):

LO ONE: Contributing to the UCO initiatives, this creative- and project-based approach will support students' *development of comprehension and conceptualization*, while substantially improving capacities for *contextualization*. This includes the development of:

(1) creative and dynamic thinking, which allows students to explore scientific problems from various angles and perspectives;

(2) conceptualization, which is needed to shape broad and amorphous problems into clearly defined, compelling, and communicable ideas;

(3) social analysis, which is required to contextualize ideas for a broader audience. This involves: anticipating the audience, tailoring communication to

¹ see "UCO: Outcomes."



different audiences, and anticipating and navigating potentially contentious ideas (for example, the use of vaccines, or the politics of climate change).

LO TWO: Increasing students' self-efficacy as science communicators through a learning process that is: self-guided, iterative, and collaborative:

- (1) Self-guided: While the podcast assignment provides guidance and scaffolded support, groups are responsible for developing their projects. Students will exercise self-guided learning and project planning. This is enhanced by the fact that podcasts communicate with real audiences (as opposed to assignments submitted solely for evaluation).
- (2) Iterative: the iterative process defined by weekly episodes allows students to use reflection, peer review, iterative instructor feedback and practice to continue improving relevant skills. This creates an environment of ongoing, reflective practice, as opposed to one-off, graded assignments.
- (3) Collaborative: Creating podcasts will require students to work together to develop a multi-stage project. It will also require groups to organize themselves efficiently. This includes, for example, assigning specific roles to each member, communicating effectively with group members, and ensuring each member stays on schedule.
- LO THREE: Expanding the range of student communication skills:

(1) Orienting a diverse set of communications skills (interviewing, public speaking, etc.) toward one project.

(2) Students will learn the basics of audio recording and production; these skills are increasingly important in a range of fields and occupations, and generally not familiar to students.

(3) By podcasting, students engage in real, ongoing, public and scientific discussion. As such, students engage in and navigate dialogue within a dynamic and complex social environment.

d) Project rationale and description, including review of relevant literature (where applicable) and contextual information:

This project is designed in response to the Undergraduate Communications Outcomes (UCO), a campus-wide effort implemented to strengthen communication abilities in all undergraduate programs. The UCO prioritizes three general outcomes: comprehension;



conceptualization; and contextualization.² And a key initiative for achieving these outcomes is the implementation of 'Communication Intensive Courses' for first-year students.³ One such course is SCCOM 100: Communications in the Sciences, a faculty-wide required course taught by Communication Arts and English. Broadly, our project will analyse how to achieve the UCO goals to the highest degree possible in SCCOM 100. Our results will be useful to the continued development of the large number of SCCOM 100 courses, as well as related UCO-oriented courses, such as GENE 191. It will also contribute to research and pedagogy related to PBL, creative podcasting and audio as teaching tools, and science communication instruction.

The continued prominence of information deficit model (IDM)—both in the classroom and in science communication—significantly limits the UCO outcomes. IDM is based on the idea that there is a unidirectional flow of literacy and knowledge from the expert (the instructor or scientist) to the non-expert (the student or public). As a model for public understanding of science, IDM presumes that, where the public is skeptical about STEM, it is because they lack scientific literacy and knowledge. Thus, changing perceptions of scientific issues requires an increase in public scientific literacy and knowledge (Dickenson, 2005). In the undergraduate science classroom, IDM is reinforced by instructor-driven learning where students absorb and reproduce skills or knowledge predetermined by the instructor.

IDM remains prominent in spite of significant limitations.⁴ Most notably, education based on IDM thinking is ineffective, both in academic and public contexts.⁵ Moreover, science communication training should include a critique of the deficit model, showing how it works IDM works and its limitations; but this does on its own overcome IDM.⁶ The educational model must itself overcome IDM.

Project Based Learning (PBL) is a demonstrated method of doing so. PBL prioritizes student-led projects that develop over longer periods of time and culminate in products or presentations.⁷ The projects and presentations are defined by "authentic" content and assessment; there is no predetermined answers, rather students are driven to pose and respond to questions they find compelling.⁸ By prioritizing student-driven exploration

² "UCO: Outcomes."

³ "University of Waterloo Undergraduate Communication Outcomes."

⁴ Besley and Tanner, "What Science Communication Scholars Think About Training Scientists to Communicate."

⁵ Meyer, "In Science Communication, Why Does the Idea of a Public Deficit Always Return?"; Baram-Tsabari and Lewenstein, "Science Communication Training."

⁶ Baram-Tsabari and Lewenstein, "Science Communication Training," 293.

⁷ Thomas, "Research on Project-Based Learning."

⁸ Thomas.



and learning PBL overcomes the limitations of IDM, and has been widely shown to enhance the forms of deep learning central to the aims of UCO.

As a form of PBL, student podcasting shows significant potential for deep learning, but is under-analyzed. Ng'ambi and Lombe identified four categories of educational podcasting: a) replicating lectures, b) supplementing lectures, c) replacing lectures, and d) student produced podcasts.⁹ In his 2017 review, Sundgren notes that significant research has been conducted on categories 'a' and 'b', but much less on category 'd' (i.e. student-created podcasting).¹⁰ Moreover, while the first three models expand the time and space of learning, only the fourth (student-produced podcasts) is conducive to PBL, and is uniquely suited to contribute to the three Learning Outcomes listed above in section 'c' (contextualization, self-efficacy, and broader communication skills).¹¹

e) Plan/methods/procedures for carrying out and assessing the project:

Research will take place in the sections of SCCOM 100 instructed by the PI, with assistance from the RA. Following a series of practical and theoretical workshops on science communication, students will work in groups of four to produce one 15-minute episode each week for 5 consecutive weeks.

Evidence collection and analysis will take three forms:

i. Student self-evaluation: Each student will respond to a questionnaire; questions will be designed to ascertain how and to what degree LOs have been met, and will be analyzed by the PI and RA.

ii. Collective project reflection: Students will participate in an instructor-led discussion; open-ended questions will focus on individual and shared experiences of the project. For example: do you feel motivated to continue pursuing forms of science communication related to podcasting? How and why? Do you feel more confident and capable of tasks like speaking to/interviewing scientists?

iii. Instructor project evaluation: Students will be given instructor feedback for each episode based on a consistent rubric. The PI and RA will ascertain the degree to which work builds toward the project LOs. We will examine, for examples: is the sound production increasingly professional? Does each episode show improved organization of content?

⁹ Ng'ambi and Lombe, "Using Podcasting to Facilitate Student Learning."

¹⁰ Sundgren, "Blurring Time and Place in Higher Education with Bring Your Own Device Applications."

¹¹ see Thomas, "Research on Project-Based Learning."



The project will be developed in four stages—skill-building, planning, production and circulation, and reflection—which are here listed along with their primary LOs [corresponding to above section C] and collection of evidence:

(1) **Skill building:** The research assistant and PI will conduct in-class workshops introducing the skills needed to produce a podcast, including:

- Technical skills: covers microphone use, recording technique, editing, and uploading to soundcloud.
- Crafting narrative: covers topics in non-fiction writing such as how to use scientific information to tell a story; anticipating and communicating with your audience; and the use of poetic and rhetorical devices.
- Speech communication: covers skills related to the effective use of the voice for recorded speech communication, such as: enunciation; cadence and vocal pauses; and how to limit speech "filler."

LOs Prioritized: LO 3.1-3: Expanding the range of communication skills.

(2) **Planning:** Each group will choose an overarching title and theme or question, and will be encouraged to stylize or "brand" their podcasts through distinctive elements (by creating a tagline, a logo, a musical introduction, etc.). Groups will also decide which member will take the lead on specific tasks (ex. writing, recording, editing, etc.).

Groups will be given task-based prompts for each episode designed to help students develop essential communication skills, including: interview a scientist; report on a science-related event; and review a science-related cultural text (such as a documentary). Prompts will allow groups to plan all episodes in advance and to provide guidance.

LOs Prioritized: LO 1.1-3 Development of comprehension, conceptualization, and contextualization.

LO 2.1 and 2.3 Increasing students' self-efficacy through: 2.1 Self-guided work; 2.3 Collaborative work.

(3) **Production & Circulation:** During the five weeks of production, groups will record, edit, and upload one episode per week. Students will be incentivized to use their podcasts to engage in broader dialogue; for example, by following and gaining followers in the scientific podcasting and journalism community. Brief in-class discussions will provide students with time to discuss and reflect on their own work (ex. What were the difficulties, how can we improve), and on the episodes of classmates.

LOs Prioritized: LO 1. Development of comprehension, conceptualization, and contextualization, through: 1.1 Creative and dynamic thinking; 1.2 Conceptualization; and 1.3 Social analysis.



LO 2.1-3. Self-efficacy. Especially, 2.2 Self-efficacy through an iterative process of learning and reflection.

LO 3. Expanding range of communication skills. Especially 3.3 Engaging in real public dialogue.

(4) **Reflection:** Students will reflect on their work and experience. Using both group discussion and individual questionnaires, the reflection stage will serve as an opportunity for students to reflect on their work, their group, and their projects.

During the reflection process, the PI and RA will collect two of three forms of evidence collection: i. Student self-evaluation; and ii. Collective project reflection.

LOs Prioritized: LO 1.1-3 Development of comprehension, conceptualization, and contextualization.

LO 2.1-3. Self-efficacy

f) Statement regarding areas of expertise of project applicant(s)

This project requires two areas of expertise, both of which are held by the PI:

- (1) *Digital audio recording, production and circulation:* the PI has used digital audio production as a teaching tool; has professional experience recording and producing audio; and has extensive knowledge of available tools.
- (2) *Qualitative research:* the PI has previously conducted, presented, and published qualitive research in established scholarly venues.

g) Outline of project's broader impact -- contribution to UWaterloo community and beyond:

This research will have three broader spheres of impact:

- (1) Our results will directly contribute to the further development of the large number of SCCOM 100 courses. Our analysis will promote and guide the use of PBL across the UCO mandated courses. Being among the first research projects to deal specifically with these newly implemented courses, our research has the potential to increase consistency across sections. This will include further collaboration among the faculty of science, and the departments teaching these courses – Communication Arts and English.
- (2) The iterative PBL framework could serve as a grounding pedagogical principle for the campus-wide, UCO-mandated communications courses across faculties and disciplines. In short, this project could have near university-wide effects,



enhancing how UW students develop effective communication skills. This kind of contribution depends upon the timely and sustained support of a LITE Grant.

(3) This research will contribute to established and growing research on PBL, podcasting, and science communication learning. In particular, combining these three elements in an iterative student-centered project, this research will illuminate the use of PBL in first-year courses, within the field of science communication and beyond.

h) Plan for dissemination:

Developing the project's broader impacts outlined above (section g), research dissemination will take three forms:

- (1) Research will be communicated through departmental meetings and the UCOI Committee (of which the PI is a member) with the intention of incorporating results into the curriculum as a whole.
- (2) Form 1 (communication through departmental and committees) will serve as the launch point for implementing research results in campus-wide instruction of UCO-mandated communications.
- (3) Included in our proposal is the funding to present at two established, relevant conferences. These conferences will facilitate the distribution of research, while gaining valuable feedback from experts in the field. These conference papers and feedback will serve as the basis for 1-2 scholarly journal articles addressing the topics of PBL, student podcasting, and introductory communications instruction. Equally significant, students' podcasts have a "built-in" form of dissemination: by planning, creating, uploading and promoting professional-level podcasts, students broadcast the work of UW science on an international level.

i) Budget:



LEARNING INNOVATION AND TEACHING ENHANCEMENT (L	ITE) GRANTS
Proposal Template for LITE Full Grants	-

Items	Amount Year 1	Amount Year 2	Justification
Condenser USB Microphone (ex. Audio-Technica AT2020-USB-PLUS or similar): \$209 x 6 microphones	\$1254	N/A	 Purpose/tasks: USB Mics provide simple to use, high quality recording for recording podcasts 6 items are required to ensure adequate access to the microphones
Conference funding to present research at CCA: Flight: \$630 Hotel: (\$120 x 3 nights): \$360 Conference fee: \$200 Per diem expenses: (\$70 x 3 days): \$210	\$1400	\$1400	- Present research; receive feedback (Costs are estimated)

Research Assistant(s)	Rate	# hours	Amount	Amount Year 2	Justification
			Year 1		
Graduate Research	\$40.35/hr	30hrs/section	\$5035.68	\$5035.68	Purpose/tasks (hrs per
Assistants (Masters)	4% Vacation	4 sections/yr			section):
(pay	120 hrs			



				 Support in- class work (10 hrs) Support analysis of submitted assignments (10 hrs) Support analysis of questionnaires (10 hrs)
TOTAL		Total year 1:	Total year 2	Total year 1+year 2
		\$7689.68	\$6435.68	\$14125.36

j) Sustainability:

A broad aim of this project is to examine and implement PBL as a core component of the SCCOM 100 curriculum. This ensures sustainability of results: by directly impacting a faculty-wide, required course, this research would be sustained by the course itself, without further resources.

k) Timeline

An overview of the project, which includes important deadlines and milestones (e.g., ethics application deadlines, data collection completion, syntheses of best practices, etc.) should be included. Annotated visual representations (e.g., Gantt charts, tables) may be used.

2019

Winter: Round 1.A.

Jan Finalize Ethics Approval



Feb-Apr	Implement research project in two sections (50 students) of SCCOM 100.
May	Report results and initial recommendations to UCOI Committee and SCCOM 100 instructors.
Jun	Present research at Canadian Communication Association (CCA) Annual Conference.
Jul – Aug	Review results and incorporate conference feedback to evaluate possible improvements for second round of research.
	Discuss results and further research with UCOI Committee (Dept of Communication Arts).
Sep	Participate in leadership role in Instructor Training (Dept of Communication Arts)
Fall: Round	1.B.
Sep – Dec	Implement research project in two sections (50 students) of SCCOM 100.
Dec	Review and analyze evidence;
	Report progress and recommendations to UCOI Committee (Dept of Communication Arts) and with UCO representatives from Faculty of Science;
	Make results available to instructors of SCCOM 100 and GENE 191.
	Submit LITE Grant Progress Report

2020

Winter: Round 2.A.

Jan-Apr Implement research project in two sections (50 students) of SCCOM 100.



May	Report results and initial recommendations to UCOI Committee and SCCOM 100 instructors.
Jun	Present research at Canadian Communication Association (CCA) Annual Conference.
Jul – Aug	Review results and incorporate conference feedback to evaluate possible improvements.
	Outline draft of research paper for publication.
	Discuss results and further research with UCOI Committee (Dept of Communication Arts).
Sep	Participate in leadership role in Instructor Training (Dept of Communication Arts)
Fall: Round	2.B.

- Sep Dec Implement research project in two sections (50 students) of SCCOM 100.
- Dec Review and analyze evidence;

Report results and final recommendations to UCOI Committee (Dept of Communication Arts) and UCO representatives from Faculty of Science;

Make final results available to instructors of SCCOM 100 and GENE 191.

Submit LITE Grant Final Report



WORKS CITED

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