TLEF Project – Final Report

Report Completion Date: (2021/04/30)

1. PROJECT OVERVIEW

1.1. General Information

Project Title:	Catalysts: learning modules addressing content and language gaps
Principal Investigator:	Sandra Brown
Report Submitted By:	Sandra Brown
Project Initiation Date:	April 1, 2018
Project Type:	☐ Large Transformation ☒ Small Innovation ☐ Flexible Learning ☐ Other: [please specify]

Project Initiation Date:	April 1, 2018	**Project Completion Date:**	March 31, 2020

1.2. Project Focus Areas – *Please select all the areas that describe your project.*

☒ Resource development (e.g. learning materials, media)

☐ Infrastructure development (e.g. management tools, repositories, learning spaces)

☐ Pedagogies for student learning and/or engagement (e.g. active learning)

☐ Innovative assessments (e.g. two-stage exams, student peer-assessment)

☐ Teaching roles and training (e.g. teaching practice development, TA roles)

☐ Curriculum (e.g. program development/implementation, learning communities)

☐ Student experience outside the classroom (e.g. wellbeing, social inclusion)

☐ Experiential and work-integrated learning (e.g. co-op, community service learning)

☐ Indigenous-focused curricula and ways of knowing

☐ Diversity and inclusion in teaching and learning contexts

☐ Open educational resources

☐ Other: [please specify]

1.3. Final Project Summary

Technology-based practices within curriculum offer the possibility to address academic achievement gaps faced by our increasingly diverse student body. Undergraduates in upper level courses include domestic, transfer, and international students who face challenges related to pre-requisites, course equivalency, Canadian specific content, and for some students studying in a foreign language. This project tackles these challenges through online modules which utilize diverse delivery and assessment methods focused on comprehension and discipline specific content. Modules review discipline and Canadian specific content, and are delivered in text, graphic, audio/video and animated formats. Prototype content modules were developed for soil science courses within the Sustainable Agriculture and Environment (SAGE) major. Content was originally developed in edX-Edge, a cloud-based online platform which supports flexible, online learning. Pilot modules were implement in upper-level soil science courses in 2018/19 and 2019/20 academic years. However, with the onset of COVID-19 and the transition to online teaching and learning, content was transferred to Canvas, and select modules were directly incorporated into specific Canvas courses. Merging content on a single platform was a key step in developing an uncomplicated course structure, and considered essential in the online environment. Core modules including *from sediment to soil*, *the soil food web* and *soil nano-particles*, engage students with online content through animations, videos, breakout group activities, and self-study guides. The pivot from edX-Edge to Canvas was unplanned, but the resulting content modules were indispensable to fully online teaching in soil science courses during the COVID-19 pandemic in 2020/21.

1.4. Team Members – *Including __students__, undergraduate and/or graduate, who participated in the project.*

Name	Affiliation & dates involved	Responsibilities/Roles
Sandra Brown	Assistant Professor of Teaching, Applied Biology / Soil Science, Faculty of Land and Food Systems, PI 2018-2021	Content layout and organization, led content development, supervised worklearn students
Edmund Seow	Computer Systems Manager, The Learning Centre, Faculty of Land and Food Systems, Co-PI 2018-2021	Technical support, co-supervised worklearn students, led transition from edX-edge to Canvas
Cagla Buzluk	Summer work learn 2018 MLWS student, Land and Water Systems	Developed online soil science learning content, co-led the soil food web module
Dustin Bright	Summer work learn 2018 Undergraduate student, Global Resource Systems	Drafted module learning objectives, importance & implications – the undergraduate perspective
Felicia Tjeng	Summer work learn 2018 Undergraduate student, Visual Arts & Cognitive Systems)	Graphic design; Developed copyright compliant multi-media resources for use in online learning resources
Manuel Dias	Learning technologies & Faculty Liaison, CTLT, 2018-2021	Provided edX-edge support & training, advanced assessment tools

Will Engle	Strategies, Open Education Initiatives, CTLT, 2018-2021	Advisor, software platform(s)
Les Lavkulich	Professor Emeriti, Soil Science, Summer 2018	Content review for soil formation
Ashenafi Aboye	SoTL specialist supported by ISoTL, Summer 2018	Project evaluation
Akshit Puri	TA APBI 401, Fall 2018 PhD student, Soil Biology	Review & implementation of the soil foodweb exercise
Chantel Chizen	Work learn term 1 2019 MSc student, Soil Science / soil chemistry	Content development for soil chemistry fundamentals
Dixi Modi	Work learn term 1 2019 PhD student, Below ground ecology	Soil organisms – who am I and what do I eat; development of a peer-to-peer learning exercise (including instructor key)
Skyler Li	Academic community Rover, Summer 2020	Transition of content from edX-edge to Canvas

1.5. Courses Reached – *past*, *current*, and *future* courses and sections that have been/will be reached by the project, including courses not included in the original proposal.

Course	Section	Academic Year	Term (Summer/Fall/Winter)
APBI 401, LWS 501, SOIL 501[a]	001	2018 - ongoing	Winter term 1 (Sep-Dec)
APBI 402, SOIL 502[b]	001	2019-ongoing	Winter term 2 (Jan-Apr)
APBI 403, SOIL 503 [c]	001	2018, 2022 forward	Winter term 1 (Sep-Dec)
APBI 200[d]	001, 002	2020	Winter term 2 (Jan-Apr)
APBI 30x[e]		2022/23	

[a]Modules developed as part of this project were fully implemented in APBI 401 / LWS-SOIL 501 – *Soil Processes* including *from sediment to soil*, *the soil food web* and *soil chemistry fundamentals*. Additional content on *water for crops and ecosystems* will be added in 2021/22. As APBI 401 is a theory course, comprehensive online content is essential, particularly given the need for hybrid course formats in the upcoming academic year, and content developed in this project, filled this gap.

[b]Select modules were incorporated in APBI 402 – *Sustainable Soil Management*, specifically, *integrating soil organisms in soil quality frameworks*, and *interpreting soil surveys*. The breakout group activity (and related instructor resources) on soil organisms was a key activity for students to make the link between soil organisms and sustainable soil management. Individual students researched one soil organism, and in small teams, students combined that information to develop a partial soil quality framework assessing the role of organisms in nutrient cycling. This provided a foundation piece for the PBL cases related to soil biological quality.

[c]In APBI 403 – *Soil Sampling, Analysis and Data Interpretation*, this project supported the section of the course related to soil biological functions and activity. The role of enzymes in organic matter decomposition is a "muddy point" for most students taking this course.

[d]In APBI 200, select graphics were incorporated into the Canvas course content to fill gaps, largely in the soil physics component of the course.

[e]APBI 30x Nutrient, *Soil & Water Management*, is a proposed topics course, planned for 2022/23 academic year, and which draws from modules developed in this project. The planned focus of the course is on farm/field scale nutrient budgets and crop water requirements, including environment concerns and beneficial management options.

2. OUTPUTS AND/OR PRODUCTS

2.1. <u>*List*</u> *of project outputs and/or products.*

Product(s)/Achievement(s):	Location:
Content modules released, term 1 2018/19W, integrated into APBI 401	https://edge.edx.org/courses/course-v1:UBC+APBI401+2018_W1/about
Revised / expanded content modules released, term 1 2019/20W, integrated into APBI 401, 402, 403	https://edge.edx.org/courses/course-v1:UBC+APBI40x+2019_W1-2/about
Content transitioned to Canvas summer 2020, integrated into APBI 401 and 402 (online versions)	https://canvas.ubc.ca/courses/66474 https://canvas.ubc.ca/courses/57707/pages/soil-biological-quality-concepts?module_item_id=2103790
Student survey – effectiveness of content delivery to support student learning (2021)	Qualtrics report (available upon request)

2.2. Item(s) Not Met –*List of intended project outputs and/or products that were not attained and the reason(s) for this.*

Item(s) Not Met:	Reason:
Open Educational Resource (OER)	In the spring of 2020, I was advised that UBC would no longer be supporting edX-Edge. Upon meeting with Will Engle and Manual Diaz (CTLT) the decision was taken to move the project learning resources to Canvas.
Language perspectives - assessment	The hyperlinked glossary function available in edX-Edge was replaced by "definitions and distinctions" within Canvas modules. Advanced assessment, such as automated essay grading tools, are not integrated within Canvas. Linking to software, such as Grammarly, has not been explored at this point in time.
Evaluation of OER content in edX-Edge	Personnel changes in the SoTL specialist associated with the project delayed the evaluation component. Content was moved from edX-Edge to Canvas, and components incorporated into specific courses. Consequently, the survey shifted to a focus on student perceptions of different modes of content delivery (historic Canvas content vs content imported from edX)
Dissemination of project results	The shift from edX-Edge to Canvas, and delays in evaluation shifted the scope of the project from evaluating an OER to an assessment of different modes of content delivery (e.g., animation, text, pre-recorded lectures). Results will be disseminated via a LFS Learning Centre Brown Bag Lunch Series, and a research note on student perceptions will be written once additional data is collected (2021/22 to 2022/23 academic years).

3. PROJECT IMPACT

3.1. Project Impact Areas

☒ Student learning and knowledge

☒ Student engagement and attitudes

☐ Instructional team-teaching practice and satisfaction

☐ Student wellbeing, social inclusion

☐ Awareness and capacity around strategic areas (indigenous, equity and diversity)

☐ Unit operations and processes

☐ Other: [please specify]

3.2. What were you hoping to change or where were you hoping to see an impact with this project? – *Intended benefits of the project for students, TAs, instructors and/or community members.*

Undergraduates in upper level courses include domestic, transfer and international students who face challenges related to pre-requisites, course equivalency, Canadian specific content, and for some students, studying in a foreign language. The goal of the project was to develop open access, online modules which utilize diverse delivery and assessment methods focused on comprehension and discipline specific content, with additional support tools for second language learners.

The intended impact of the project was two-fold.

1) to level the academic playing field
2) to reduce language barriers

Benefits of the project focused on both domestic and international students, recognizing that diverse methods of content delivery and assessment enhance student engagement, and accommodate students with diverse academic backgrounds.

Language comprehension and communication supports were directly incorporated within content modules.

Prototype content modules were developed for soil science courses within the Sustainable Agriculture and Environment – SAGE major, with the intent to evaluate this hybrid content/language approach, revise and scale-out.

3.3. Were these changes/impacts achieved? How do you know they occurred?

Partially. The "discontinuation" of institutional support for edX-Edge at UBC, and the rapid transition to online teaching due to the COVID-19 pandemic necessitated rethinking the direction of this project. Collaboratively with representatives from CTLT (Will Engle and Manual Diaz), the decision was made to migrate the project to Canvas. The shift in platform meant a loss of some functionality in the language component, including the hyperlinked glossary function, although this was replaced by "definitions and distinctions" within Canvas modules.

With confirmation that UBC courses in 2021/22 would be virtual, content modules were split up, and relevant components incorporated into different upper level soil science courses. From the student perspective, online modules originally in edX-Edge, and historic Canvas content (lecture slides, readings, assignments) became indistinguishable. This meant a shift in evaluation away from student perspectives on the utility of specific edX-Edge modules to a narrower focus on different modes of content presentation.

Student perceptions on the diverse modes of content delivery was collected via a course survey for APBI 401 / LWS-SOIL 501 during 2020/21 (n=15). The survey contained Likert scale questions on the effectiveness different course components in supporting student learning, and student preferences between "text-based" content and pre-recorded lectures. In this preliminary assessment, 90% of respondents found group assignments to be very or extremely effective in supporting their learning. GIFs/animations and pre-recorded lectures ranked 2nd in terms of students' rankings (mean score of 4.0 on a 5 point Likert scale), and guest presentations and supplemental readings ranked lowest.

Low-stake, group assignments were implemented in this course as a precursor to individual reports. The results of the student survey reaffirm the utility of scaffolding activities and assignments to help student construct new knowledge by gradually increasing cognitive complexity.

Table 1. Student perceptions on the effectiveness of diverse modes of content delivery.

Item	Mean	Std
Descriptive text (in Canvas)	3.8	0.75
Photographs	3.7	0.90
Drawing/schematics	3.9	0.94
GIFs/animations	4.0	1.10
Pre-recorded lecture	4.0	0.89
Guest presentations	3.0	1.10
Supplemental readings	3.0	0.45
Self-study questions	3.8	1.17
Breakout groups & plenary discussion	3.9	1.22
Group assignments (as a precursor to individual reports)	4.3	0.64

When students were asked their preference between largely text-based content and pre-recorded lectures, 60% of respondents indicated they preferred an equal mix. One student commented that *"The pre-recorded lectures are nice for grasping concepts in a different way, it mixes things up…. An equal mix of different methods could compliment each other".*

From an instructor's perspective, this result was somewhat surprising as the pre-recorded lectures where a "quick" way to get content online. Moving forward, I will aim to provide a combination of asynchronous mini-lectures and key diagrams supplement with text-based information.

3.4. Dissemination

The shift from edX-Edge to Canvas shifted the scope of the project from evaluating a stand alone OER to an assessment of different modes of content delivery (e.g., animation, text, pre-recorded lectures). Based on preliminary results from student surveys in 2020/21, a research note on students' perceptions of effective content delivery in online & blended teaching and learning will be developed once additional data has been collected (2021/22).

4. TEACHING PRACTICES

Involvement in this small TLEF project has shifted my practices towards more student centred teaching and learning. In particular, the worklearn students involved in the project clearly articulated the perspective of a student. They identified components of courses they had taken that lacked clarity. They stressed the importance of starting with "why you should care". They proposed ideas to engage students. The following three examples illustrate the impacts on my teaching practices, that I will carry forward.

Application before theory
Working in a team with students who had recently taken one or more of the target courses shifted my thinking on content delivery from theory followed by application, to the reverse. Flipping content to start with "how is the information in this module useful" takes a more student centered focus. One of our team's work learn students suggested and coordinated short intro videos such as 'why is understanding geology important to understanding soils?"

Scaffolding assignments
Another team member focused on in-class activities that would support student learning, and developed low stakes group assignment focused on the roles of soil organisms. While I had done a similar exercise for rocks, we developed several activities where each student was assigned a mini-homework, and then students worked collaboratively in-class to merge that information into a coherent narrative.

Animations
Blending graphics and text can be effective in conveying complex concepts. Having the opportunity to work with a graphic artist who also specialized in cognitive systems provided the opportunity to explore combinations of photography, animated GIFs, animated videos and schematic drawings. Examples include: the structure of silicate minerals, "how to build a feldspar", and changes in clay minerals with weathering (https://www.youtube.com/watch?v=6BuoS49cspo&t=28s).

Presenting applications prior to theory, and scaffolding assignments are two approaches which I have incorporated into my classes and will continue to use. Access to a graphic artist is a more difficult to sustain, but the creativity of individual student assistants (e.g., UAA) can be leveraged to provide schematics and simple animations (e.g., using pptx).

5. **PROJECT SUSTAINMENT** – *Sustainment strategy for the project components. How will this be sustained and potentially expanded (e.g. over the next five years). Challenges foreseen for achieving the expected long-term impacts listed above.*

Three modules were piloted as part of the project. The combination of text, with graphics and animations was viewed favorably by students. The model developed will continue to be used in participating courses, however based on student feedback, this content will be provided alongside of lecture notes, readings and other course materials.

The change in platform from edX-Edge to Canvas created a challenge for the project, as materials were modified for specific courses. Simultaneously this created an opportunity as online content was integrated with assignments, readings and pre-recorded mini-lectures. This provided students with a single, seamless course site (as opposed to having a supplement online resource).

Moving forward, modules will be expanded and utilized to support a proposed experiential learning course on Nutrient, *Soil & Water Management.*