



TLEF Project – Final Report

Report Completion Date: (2021/04/30)

1. PROJECT OVERVIEW

1.1. General Information

Project Title:	Development of online learning modules as an innovative approach to teaching a Vantage College introductory engineering design course with embedded language and technical communication components		
Principal Investigator:	Dr. Vladan Prodanovic		
Report Submitted By:	Dr. Vladan Prodanovic		
Project Initiation Date:	2019/04/01	Project Completion Date:	2021/03/31
Project Type:	<input type="checkbox"/> Large Transformation <input checked="" type="checkbox"/> Small Innovation <input type="checkbox"/> Flexible Learning <input type="checkbox"/> Other: [please specify]		

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

1.4. **Team Members** – Please fill in the following table and include students, undergraduate and/or graduate, who participated in your project.

Name	Title/Affiliation	Responsibilities/Roles
Gabriel Potvin	Associate Professor of Teaching, CHBE, Faculty of Applied Science	Faculty member, project applicant and contributor to the content of the modules.
Juan Abello	Assistant Professor of Teaching, MECH, Faculty of Applied Science Chair of Eng. stream, Vantage College	Faculty member, project applicant and contributor to the content of the modules.
Saloome Motavas	Lecturer ECE, Faculty of Applied Science	Faculty member, project applicant and contributor to the content of the modules.
Sandra Zappa-Hollman	Assistant Professor Faculty of Education Director of Academic English Program, Vantage College	Faculty member, project applicant and contributor to the AEP content of the modules.
Alys Avalos-Rivera	Lecturer, AEP (Engineering) Vantage College	Faculty member, project applicant and contributor to the AEP content of the modules.
Behzad Zakani	Graduate student, MECH	Contribute to development of modules 1, 2 and 4, which includes collecting, sorting and analyzing relevant information (investigate written literature available through the UBC library, and online content), script writing, production, and development of assessment methods
Arjav Shah	Graduate Student, CIVL	Contribute to development of modules 5 and 6 on life cycle analysis and openLCA software. Responsibilities include preparing instructional materials on life cycle analysis and openLCA software, scrip writing, production and creating assignments/quizzes related to LCA and impact assessment
Emerald Holt	Graduate student, Faculty of Creative and Critical Studies, UBCO	Graphic design of modules, which includes graphical presentation of



		interactive components within the modules, and development and implementation of small video animation sequences to support content delivery.
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1.5. Courses Reached – Please fill in the following table with **past**, **current**, and **future** courses and sections (e.g. HIST 101, 002, 2017/2018, Sep) that have been/will be reached by your project, including courses not included in your original proposal (you may adapt this section to the context of your project as necessary).

Course	Section	Academic Year	Term (Summer/Fall/Winter)
VANT 150		2020/2021	Sep/Jan
VANT 140		2020/2021	Sep/Jan



2. OUTPUTS AND/OR PRODUCTS

2.1. Please list project outputs and/or products (e.g. resources, infrastructure, new courses/programs). Indicate the current location of such products and provide a URL if applicable.

Product(s)/Achievement(s):	Location:
Module 1: The Problem Statement as the Foundation for a Good Design	VANT 150 Canvas course page/ media gallery
Module 2: Design Tools – From Generation to Execution	VANT 150 Canvas course page/ media gallery
Module 3: Industrial Ecology in Practice	VANT 150 Canvas course page/ media gallery
Module 4: Earth as a Global Thermodynamic System – Global Cycles	VANT 150 Canvas course page/ media gallery
Module 5: Life Cycle Analysis	VANT 150 Canvas course page/ media gallery

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

Item(s) Not Met:	Reason:
Module 6: Creativity and Engineering Design	The initial idea to create 6 online modules which would complement the VANT 150 lectures was substantially affected during Covid, as creating online content became a necessary and critical activity for the instructors. Equipment and expertise (originally budgeted in the project proposal) became available through various UBC services, and most modules were prepared, in part, as regular teaching/course preparation work. The module on creativity and engineering design was implemented in segments (examples and case studies) within other lecture materials

3. PROJECT IMPACT

3.1. Project Impact Areas – Please select all the areas where your project made an impact.

- 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? – Please describe the intended benefits of the project for students, TAs, instructors and/or community members.

Introducing engineering design early, though crucial for training engineers, is often challenging for students as it requires them to radically shift their thought process from a more traditional fixed problem-solving approach, to a complex multidisciplinary decision-making paradigm in which various solutions may be possible. Students are often insecure about their design abilities, and it takes significant time for them to embrace this approach to learning. The traditional lecture/tutorial format is not the best way to foster this process.

This project aimed to make VANT150, the 1st year engineering design course in Vantage College, a more effective student-centered learning experience by replacing six traditional lectures with online modules, freeing classroom time for active learning design-related tasks and discussions. These modules include content-delivery elements and interactive components used to prepare students for class time. Collaboration with Vantage language instructors (AEP) ensure the modules enrich both the engineering and the language courses.

The intention behind the online modules was to complement lecture materials currently covered in the classroom in VANT 150, by providing a well structured and concise, visually pleasing, and informative content which introduces important engineering activities related to design. The course represents an important step in the engineering curriculum, as it builds on the growing efforts (across North American universities) to introduce systems thinking, understanding of accountability, and importance of building engineering design competencies early in the engineering programs. The goal of the modules is also to help students' disciplinary language development as well as the development of their professional communication skills, which are objectives of the VANT 140 language course linked to VANT 150.

These online modules are typically covering important subjects along the engineering design process route, and while their intention is often to lead the student into a particular subject, they may also be providing excellent materials for reflection at the later stages of the course. As modules are available to the students for the duration of the course, they can be used as reference materials for both the students and instructors.

For example, the purpose of Module 5 was to create an online instructional video on life cycle analysis (LCA) in the context of "sustainability and engineering design" and provide step-by-step instructions on working with an LCA software program to assess the environmental impacts of products and practices. In previous years, these step-by-step instructions were given live in the classroom, which posed certain challenges. For example, if a student faced technical difficulties with installing or opening the program on their computer, they would not be able to follow along with the instructions in class. Similarly, if a student fell behind the instructions or made a mistake in one of the steps, the entire class had to be held back until the issue was resolved. Such challenges did not allow for the efficient use of class time, and as a result, we did not have an opportunity to discuss and analyze the results or use additional practice examples in class. The goal of this module was to enhance the students' knowledge and understanding of LCA concepts and applications and improve their overall experience of working with the software.

The online asynchronous format gives the students the flexibility of learning at their own pace, using the examples and step-by-step instructions in the video, which in turn has a positive effect on their attitude towards learning the



subject. This also allows for time in class to be dedicated to evaluating and discussing the results of the proposed activity, and using other practice examples to solidify the students' understanding of the concepts.

3.3. Were these changes/impacts achieved? How do you know they occurred? – *How did you measure changes/impacts? (e.g. collected survey data, conducted focus groups/interviews, learning analytics, etc.) Describe what was learned from this process. You are encouraged to include copies of data collection tools (e.g. surveys and interview protocols) as well as graphical representations of data and/or scenarios or quotes to represent and illustrate key themes.*

While we didn't directly measure the impact of the online modules on students' learning, we critically observed and discussed students' engagement with the modules, and we believe that major objectives behind the project idea were accomplished. This could be well illustrated, for example, by providing feedback from one of the instructors who has had previous experience with teaching VANT 150 students the fundamentals of LCA, and subsequently used Module 5.

- This year, in contrast with previous years, we were able to dedicate the class time to in-depth discussions around life cycle analysis and impact assessment calculations. We also ran additional examples with the software as a practice and all students were able to complete and submit the results of this exercise.
- At the end of this module, we asked for students' feedback regarding the technical content of the module and the use of English language in the instructions. According to the gathered responses, 97% of the students found the instructions clear and easy to follow. The majority of the comments about the module were also quite positive. Below are some examples of students' comments:

"I think this video is very clear and it is easy for me to understand."

"For this video, I feel very good and I can understand all of what she said."

"I feel it is great."

"The information is very clear. I love it!!!"

"This video is very understandable because everything explain in detail."

- We also received some feedback from the students about adding subtitles to the video and providing additional examples that highlight the concepts. We are planning to apply these changes for next year.

3.4. Dissemination – *Please provide a list of **past** and **upcoming** scholarly activities (e.g. publications, presentations, invited talks, etc.) in which you or anyone from your team have shared information regarding this project. Be sure to include author names, presentation title, date, and presentation forum (e.g., journal, conference name, event). N/A*



- 4. TEACHING PRACTICES** – *Please indicate if **your** teaching practices or those of **others** have changed as a result of your project. If so, in what ways. Do you see these changes as sustainable over time? Why or why not?*

The project was executed at the times our approach to online learning was deeply affected by Covid. The immediate change of our teaching practices was driven by the need to provide alternative learning options to our students, but the importance of developing online learning modules to complement the delivery of classroom content has had a significant impact on our teaching practices and it is a sustainable change.

- 5. PROJECT SUSTAINMENT** – *Please describe the sustainment strategy for the project components. How will this be sustained and potentially expanded (e.g. over the next five years). What challenges do you foresee for achieving the expected long-term impacts listed above?*

The modules will be further developed and augmented with relevant contents. We also see this as an opportunity to create an engineering design content repository, and share best teaching practices with other colleagues who teach introductory engineering design courses.