TLEF Project – Final Report

Report Completion Date: (2024/02/16)

1. PROJECT OVERVIEW

1.1. General Information

Project Title:	Virtual Laboratories for Composites Materials Engineering		
Principal Investigator:	Casey Keulen		
Report Submitted By:	Casey Keulen		
Project Initiation Date:	2022/05/01	**Project Completion Date:**	2024/01/31
Project Type:	☐ Large Transformation ☒ Small Innovation ☐ UDL Fellows Program ☐ Hybrid and Multi-access Course Redesign Project ☐ 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 – *What did you do/change with this project? Explain how the project contributed toward the enhancement of teaching and learning for UBC students.*

With this project, we aimed to bridge the gap between theoretical knowledge and practical application in the field of composite materials. By developing online videos and activities that simulate hands-on lab experiences, we sought to expand access to these valuable learning opportunities, reaching a wider audience of UBC students. Since they are accessible online, students can access them regardless of their location, which helps addresses challenges such as those posed by cancelled classes or a pandemic. It also makes lab activities that would otherwise be impractical due to time restrictions possible. Ultimately, our project contributes to the enhancement of teaching and learning at UBC by fostering a dynamic and inclusive educational environment that prepares students for success in both academia and industry.

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
Casey Keulen	Assistant Professor of Teaching, MTRL	Lead
Anoush Poursartip	Professor, MTRL	Advisory
Sergey Kravchenko	Assistant Professor, MTRL	Advisory
Zach Huser	Coop Student (IGEN undergrad)	Content creation
Indigo Knights	Coop Student (MECH undergrad)	Content creation
John Atkins	Coop Student (MANU undergrad)	Content creation

1.5. Courses Reached – *Please fill in the following table with **past** and **current** courses (e.g., HIST 101, 2017/2018) that have been 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	Academic Year
MANU 230	2022/23, 2023/24
MANU 330	2022/23, 2023/24
MTRL 494	2022/23, 2023/24

2. OUTPUTS AND/OR PRODUCTS

2.1. *Please **list** project outputs and/or products (e.g., resources, infrastructure, new courses/programs). Indicate a URL, if applicable.*

Output(s)/Product(s):	URL (if applicable):
Wet Layup Video	https://compositeskn.org/KPC/A296
Prepreg Layup Video	https://compositeskn.org/KPC/A291
Dynamic Mechanical Analysis Video	https://compositeskn.org/KPC/A344
Dynamic Mechanical Analysis Dataset	https://compositeskn.org/KPC/A344
Vacuum Infusion Process Theory Video	https://compositeskn.org/KPC/A290
Vacuum Infusion Process Experiment Video	https://compositeskn.org/KPC/A290
Vacuum Infusion Process Lab Activity Video	https://compositeskn.org/KPC/A290
Vacuum Infusion Process Dataset	https://compositeskn.org/KPC/A290
Rheometer Introduction Video	https://compositeskn.org/KPC/A357
Rheometer Dataset	
Autoclave Processing Theory Video	
Autoclave Processing Experiment Video	
Autoclave Processing Lab Activity Video	
Autoclave Processing Dataset	

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

Item(s) Not Met:	Reason:
Resin Transfer Molding (RTM) video	The two main reasons that these items were not completed were: 1) The original proposal was overly ambitious (first time attempting this type of project) 2) We went deeper into the videos that were completed than initially expected (in some cases one video became three)
Material deposition video	
Composite materials through a sustainability lens video	
Composite biomaterials video	
Differential Scanning Calorimeter (DSC) video	
Mechanical Testing (tensile, compression, shear) video	

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-satisfaction

☐ Teaching practices

☐ Student wellbeing, social inclusion

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

☐ Unit operations and processes

☐ Other: [please specify]

3.2. Please provide details on each of the impact areas you selected in 3.1. – *For example, explain in which ways your teaching practices changed; how student wellbeing was impacted; how students wellbeing benefited from your project, etc.*

Our project impacted student learning and knowledge by leveraging multimedia resources to present information and knowledge that is challenging to convey through text alone. By creating videos, we provided students with dynamic and visual content that catered to diverse learning styles, allowing them to grasp complex concepts more effectively. This approach not only enhanced comprehension but also facilitated deeper engagement with the material. Furthermore, our project enabled students to access new experiences that would otherwise be impractical due to time, cost, or logistical constraints associated with traditional hands-on labs. Through these immersive activities, students gained valuable insights and practical skills, enriching their learning experiences and preparing them for real-world applications in the field of composite materials.

3.3. How do you know that the impacts listed in 3.1/3.2 occurred? – *Describe how you evaluated changes/impacts (e.g., collected survey data, conducted focus groups/interviews, learning analytics, etc.) and what was learned about your project from the evaluation. You are encouraged to include graphical representations of data and/or scenarios or quotes to represent and illustrate key themes.*

The project was evaluated through online Qualtrics base surveys at two different points in the project, one near the middle of the project when a few, preliminary videos were created using the initial look, feel and style (single videos on one topic, longer format). Feedback was considered and fed into the revision of the look, feel, and style (multiple, shorter format videos) before future videos were completed. Questions on student learning and knowledge retention, and interest/engagement showed positive results on a Likert scale in these surveys. Informal group discussions and feedback sessions were also conducted, which yielded positive results.

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?*

   Teaching practices have changed now that these videos are available. I have integrated them into my courses to both bolster in-person lab sessions as well as virtual sessions. This content makes course material delivery more robust and resistant to schedule disruptions. An excellent example of this occurred during a recent transit strike, where many students from just one lab section were not able to attend a lab session. Rather than missing the experience and remaining behind for the remainder of the semester, students were able to complete the lab using the videos created in the project and stay on track while eventually completing the hands-on session at the end of term. These changes are sustainable over time as the content is available and easy to deploy to students with minimal effort. The content is expected to stay current for the next 10-20 years.

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 project sustainment?*

   The main sustainment strategy will be continued use of this content, in the MANU and MTRL programs as well as promotion of the website where they are hosted. The topics covered in this content will remain current for the next 10-20 years. These videos can be editing in the future as the original files are retained on a secure server.

6. **DISSEMINATION** – *Please provide a list of 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). These will be included on the TLEF scholarly output page.*