



# TLEF Project – Final Report

Report Completion Date: (2024/04/30)

## 1. PROJECT OVERVIEW

### 1.1. General Information

<b>Project Title:</b>	UBC is entering the Metaverse: Gamifying Forestry		
<b>Principal Investigator:</b>	Paul D. Pickell		
<b>Report Submitted By:</b>	Paul D. Pickell		
<b>Project Initiation Date:</b>	2022/04/01	<b>Project Completion Date:</b>	2023/08/31
<b>Project Type:</b>	<input type="checkbox"/> Large Transformation <input checked="" type="checkbox"/> Small Innovation <input type="checkbox"/> UDL Fellows Program <input type="checkbox"/> Hybrid and Multi-access Course Redesign Project <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** – *What did you do/change with this project? Explain how the project contributed toward the enhancement of teaching and learning for UBC students.*

We developed a new video game using the Minetest game engine, called Minetest Classroom. This game allows teachers to create virtual classroom spaces for teaching anything in a voxel sandbox world. Teachers can create their own digital classrooms and fill it with any kind of 3D content. For example, terrain can be randomly generated in different biomes or you can create a completely empty classroom and build whatever you want or you can create digital twin classrooms from real geospatial data like OpenStreetMap and LiDAR (light detection and ranging) 3D point clouds. Additionally, we developed a tool for dynamically recording lesson plans through player actions like keystrokes, positioning, look direction, and various interactions with the world (e.g., digging, mining, or placing blocks). Teachers can record a series of actions that they want students to complete, like say moving to a particular location or looking at something or building something and then those players can be rewarded with tools, items, and privileges. This allows teachers to create immersive digital learning environments and craft unique lesson plans from within the video game.

**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
Dr. Paul D. Pickell	Assistant Professor of Teaching, Forestry	PI
Dr. Dominik Roeser	Associate Professor, Forestry	Co-PI
Michelle Zeng	Educational Strategies, Forestry	Co-PI
Ginny Hang	Master of Urban Forestry Leadership student, Forestry	Co-PI, Project Coordinator
Dr. Tara Moreau	Associate Director of Sustainability and Community Programs, UBC Botanical Garden	Advisor
Daniel Mosquin	Research Manager, UBC Botanical Garden	Advisor
Chenghao Yang	Master of Geomatics for Environmental Management student, Forestry	Digital Twin Designer
Allison Cheng	Master of Geomatics for Environmental Management student, Forestry	Digital Twin Designer
Mandy Huynh	Undergraduate student	User Interface/Experience Designer
Jiho Kim	Undergraduate student	3D Artist and Modeler
Vita Chan	Undergraduate student	Pixel Artist
Jocelynn Bachmann	Undergraduate student	Game Developer



Nanjou Olsen	Undergraduate student	Game Developer
Lukas Olson	Undergraduate student	Game Developer
Daniel Aghda	Undergraduate student	Game Developer

**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
GEM 511	2022/2023
UFOR 511	2022/2023
FRST 452	2022/2023
UFOR 400	2022/2023
UFOR 511	2023/2024



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):
GitHub Repository for Project Dissemination	<a href="https://github.com/ubc-minetest-classroom/minetest_classroom">https://github.com/ubc-minetest-classroom/minetest_classroom</a>

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:
Specific ecological mods	It became clear that we needed a comprehensive game for teaching with Minetest, similar to what Minecraft Education Editions offers for Minecraft. For example, there is no official version of Minetest that supports the ability to easily set up a classroom environment, control players, create and management classrooms, privileges, create lesson plans, etc. Therefore, we pivoted our efforts to focus on developing the classroom management system, tutorial lesson planning system, and two specific mods: “magnifying tool” for viewing taxonomic and other information about plants in the game, and “forestry tools” for learning how to use common forestry tools like a compass, laser range finder, and measuring tape to make measurements in the game.
OER Lesson Plans	We intended to make lesson plans for the game, but because the specific ecological mods above were never developed, this become impossible. However, in lieu of this objective, we did create a lot of documentation with examples of our system that is hosted on our GitHub Wiki page: <a href="https://github.com/ubc-minetest-classroom/minetest_classroom/wiki">https://github.com/ubc-minetest-classroom/minetest_classroom/wiki</a> As well, we integrated a dynamic tutorial recording tool in the game that allows teachers to create and deploy any kind of lesson plan using the video game.

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.*

**Student engagement and attitudes** – Students are more engaged with the material and learning when they are able to collaboratively participate in a virtual twin world. The Minetest Classroom game is ideal for allowing students to explore and create on their own terms in a virtual sandbox. There is particularly a significant benefit to remote learning, as Minetest Classroom can augment and extend the traditional 2D “Zoom” classroom when hosted on a multiplayer server. The game requires participation, if nothing more than moving your player around the world and making observations.

**Teaching practice** – As much as the game has improved student engagement and attitudes, it has also shifted how I teach. I am able to refocus my energy from traditional lecture slides and in-class activities to a world-sharing experience, much like a virtual field school. I have been able to prepare much more engaging lesson plans for teaching about LiDAR (light detection and ranging), geospatial coordinate systems, and cartography more generally.

**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.*

**Student engagement and attitudes** – Students have mentioned the video game in Student Experience of Instruction surveys and several students have used the video game to create their own digital twin worlds. For example, one undergraduate student used the video game to re-create a digital twin of Mount Everest for a final project. Another doctoral student used the video game to create a digital twin of a field research site on Mount Garibaldi. Several students in the Master of Geomatics for Environmental Management program have used the video game to explore new cartographies in their capstone projects.

**Teaching practice** – I have taught with the video every term and in almost every course that I teach since it was developed.



- 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?

My teaching practices have directly changed, as noted above, but one of the rewarding aspects of disseminating the video game has been to see the reactions of people in the audience who may have never before considered teaching with a video game.

- 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 project is hosted on a public GitHub repository, which is available for anyone to clone/fork and modify, improve or update. We have been actively promoting the project informally on a Minetest Edu Pop discord where like-minded teachers and educators from around the world have gathered to learn more about how to teach with Minetest. Some potential challenges that we foresee for sustaining the project are any dramatic changes to the Minetest API that could make the video game incompatible with later versions of the Minetest game client.

- 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.

Pickell, P.D. “Teaching GIS with video games in immersive digital twin worlds” UBC GIS Day Presentation, November 16, 2022.

Pickell, P.D., Roeser, D., Zeng, M., and Hang, G. “Minecraft forestry: engaging students with video game pedagogy” UBC Forestry Teaching and Learning Seminar Series Presentation, January 17, 2023.

Pickell, P.D., Roeser, D., Zeng, M., and Hang, G. “UBC is Entering the Metaverse: Gamifying Forestry” UBC Celebrate Teaching Week, TLEF Showcase Poster, May 4, 2023.

Pickell, P.D., Roeser, D., Zeng, M., and Hang, G. “Minetest Classroom: Teaching GIS with a FOSS Video Game” FOSS4GNA Conference Presentation, October 24, 2023.

Pickell, P.D. “An OpenStreetMap walking tour of UBC in a video game” UBC GIS Day Presentation, November 16, 2023.