Enhancing And Diversifying Fieldwork Teaching Through Immersive 360 Projection Space

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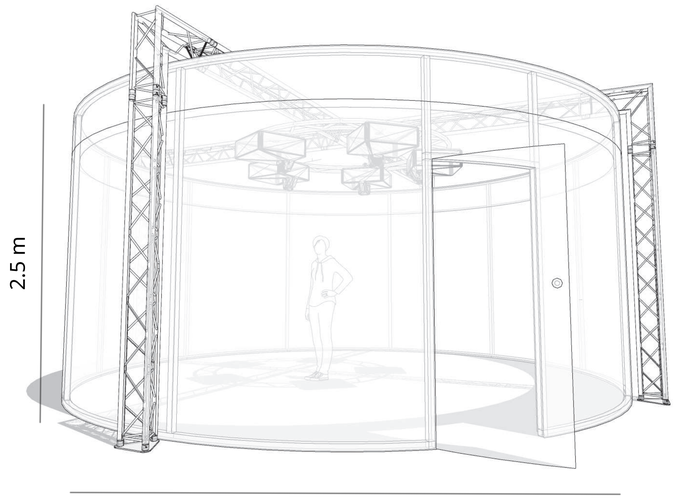
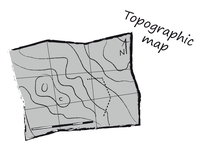
Fieldwork is a key learning component of geoscience training and education, providing student with hands-on experience and a deeper understanding of geoscience concepts and 3D spatial awareness of complex geological structures. **Research shows that extended field trips significantly enhance these skills compared to lab- or theory-based activities alone**. However, taking students to all world-class outcrops and fascinating geological sites is unfeasible due to cost, logistical challenges, environmental concerns, or restrictions during pandemic events. To address this challenge, our Geosciences Department introduced the IglooLab in 2024, an innovative immersive learning tool. The IglooLab is a 360-degree projection room, measuring 6 meters in diameter and 2.5 meters in height, equipped with five short-throw projectors and a surround sound system built by Igloo Ltd. It accommodates up to nine students and a teacher, offering high-resolution, interactive 360° media, such as photospheres, 360° videos, virtual tours (created with KR Pano), and 3D digital outcrop models displayed using game engine frameworks (Unity platform).



Control room equipped with ICE software (Igloo Ltd.)



>>> The IglooLab does not replace traditional field trips but enhances geoscience education in multiple ways. It serves as a multifunctional tool for virtual visits to world-class outcrops, preparation for field safety and best practices, and post-field trip debriefing and report corrections in an immersive, interactive environment. This innovative approach ensures that students receive a well-rounded, practical education while overcoming logistical barriers and expanding their exposure to diverse geological settings.

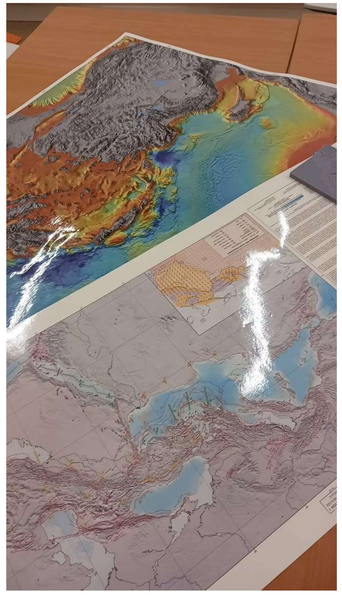
Fieldwork preparation

Through the IglooLab, we train students in essential field practices to ensure safety and efficiency in real-life fieldwork. This includes the use of geological compasses, topographic maps, and field notebooks in the virtual environment. Students work on 360-degree high-resolution fieldwork images georeferenced to the north, allowing them to conduct detailed outcrop observations and descriptions. They practice using the compass on artificial outcrops aligned with structures observed on the screen.

Fieldbook

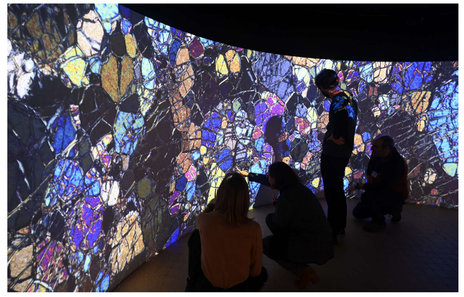
Geological compass

Geomorphology / Landscape deciphering



Through a virtual tour of the Gulf of Corinth in Greece, students examine active tectonic markers at multiple scales, from detailed outcrop features to landslide geometries, using georeferenced high resolution 360 fieldwork images. They assess the extent of large-scale terrace extensions and knickpoints locations using a 3D model (i.e. DEM with satellite imagery texture) in which students navigate via a Playstation gyroscopic controller. They document their observation on topographic maps and discuss the kinematics of observed structures.

Petrology & Volcanology



Using 360° video of eruptions combined to 3D models of volcanic edifices, students identify and describe morphotectonic features, link volcanic products to eruption dynamics, and analyze how these features can be related to volcanogenic processes. The 3D models are built with a DEM with a high-resolution satellite imagery texture. Students can navigate through various volcanic edifices (including Fuji, Etna, Mount St. Helens, Fagradalsfjall and the Chaine des Puys volcanoes) using a PlayStation gyroscopic controller. They can dynamically switch textures to geological maps, risk maps with the same controller. The adjacent facilities allow students to work with rock samples (macroscopic samples and thin sections under the microscope) through a dynamic interplay between virtual field experiences and hands-on rock analysis.

If you want to know more about the IglooLab

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