# Enhancing surveying engineering education with immersive virtual reality

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**Abstract:** A major component of surveying engineering education is outdoor laboratories that aim to train and familiarize students with surveying equipment, practices, and techniques for data collection. However, outdoor activities are weather dependent, leading to cancelled labs due to rain or snow. This disrupts the education process and limits the time students spend with instruments. In addition, outdoor activities often take place in a small area around the campus location, which limits student comprehension and preparedness on how to use techniques and instruments in real case scenarios. Conducting laboratories off campus is not suggested due to transportation cost and safety.

These challenges can be addressed with the introduction of new technologies, namely immersive virtual reality, in surveying education. Immersive virtual reality has the ability to take students to places they cannot physically be and creates the feeling of "being there". Thus, it increases the presence of uses compared to traditional virtual reality methods. Immersive virtual reality can increase student engagement with the virtual environment. Therefore, supplementing real laboratories with virtual ones has the potential to increase student engagement, learning, comprehension of surveying methods, and develop skills with surveying equipment.

An integral part of immersive virtual reality is the environment where the students will conduct the surveying labs. The virtual environment used in this study is realistic, as it utilizes modern instruments and technologies such as terrestrial laser scanning and unmanned aerial systems.

This presentation will discuss the data collection and modeling aspects of the project, as well as creation of laboratories and relevant exercises. Currently, our immersive virtual reality implementations use leveling as the main instrument. However, future efforts will focus in including exercises based on total station instruments. Finally, we will discuss the pedagogical contribution of virtual reality technology in surveying education.