XR in Interprofessional Learning: Facilitating Engineering-Medicine Interactions

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Background

The goal of this project is to utilize extended reality tools to promote interprofessional learning between biomedical engineering students and medical professionals. Currently, only a small fraction of BME students get meaningful exposure to the clinic. The use of XR will increase access to the clinical environment for BME students, and thereby will greatly enrich their training and their ability to be effective as engineers solving problems in medicine and healthcare.

Project team (Zoie, Jan, and Basheer) at the conclusion of the Winter 2023 module.

Methods

The XR module was run in Dr. Stegemann's BIOMEDE 599 class in the fall 2021 and winter 2023 semesters, with a few minor changes in between versions. However, the overall structure and timeline of the module remained the same.

Day 0: Introduction to Module
- Introduce project goals and objectives
- Ensure students can fully access Unity

Day 1: Segmentation
- VR headset exploration with Mimics Viewer
- In class segmentation tutorial using Mimics
- *Homework*: Segment assigned scan into 3D model and meet with mentor to discuss scan

Day 2: VR World Building
- Convert Mimics model into one compatible with Unity
- In class tutorial of Unity and available features
- *Homework*: Create VR world to present model

Day 3: Showcase
- Each team gives a 5-10 minute presentation of their model in their completed VR world
- Instructional team, project team, peers, clinicians, and residents observe and ask questions for 5-10 minutes

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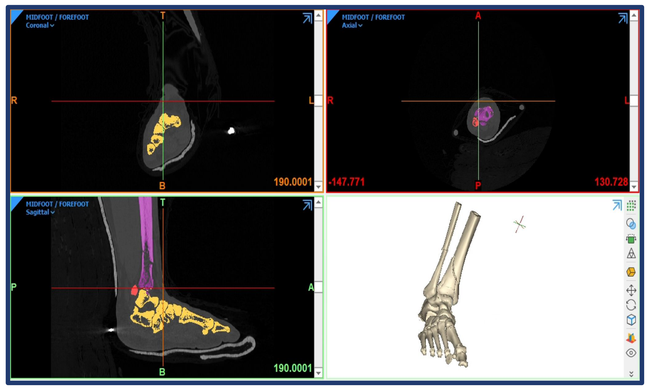
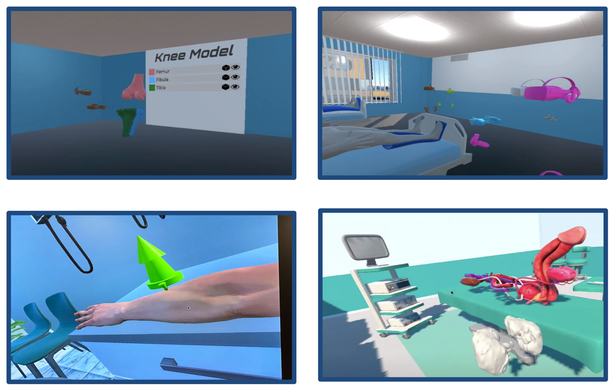
Results



Example of segmented model created by teams as day 1 HW.

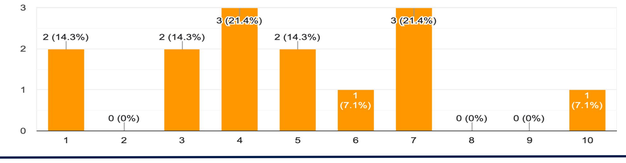


Examples of segmented models and designs in VR environments.

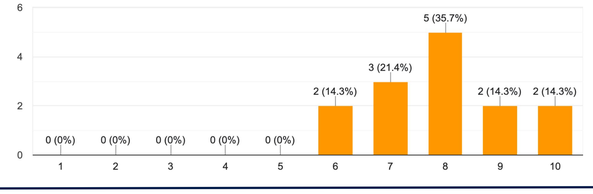
Both the fall 2021 cohort of 28 students and the winter 2021 cohort of 14 students successfully completed the VR module. Based on feedback from the fall 2021 cohort, most of the winter 2023 teams were assigned a scan that had relevance to their year long design project. In addition to learning how to segment images with the Mimics software and how to create and navigate a virtual environment using the Unity game engine, the students in both cohorts were also asked to complete a pre and post module experience form. The pre module experience form collected information on the students' previous experiences using XR, interacting with clinicians, using XR to interact with clinicians, and with interprofessional learning. The post module experience form asked students these same questions, and invited them to elaborate on their experience with free response questions. The survey results from the winter 2023 cohort can be seen below.

Pre - Module

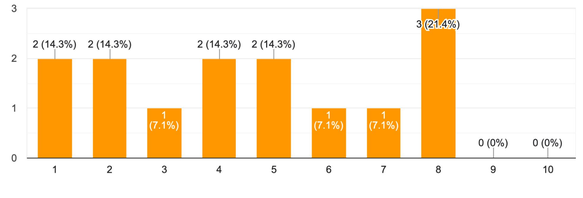
How comfortable do you feel using XR (extended reality)?



How comfortable do you feel interacting with clinicians as an engineer?

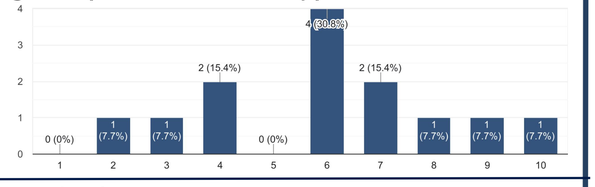


How comfortable do you feel using XR to interact with clinicians?



Post - Module

How comfortable do you feel using XR (extended reality)?



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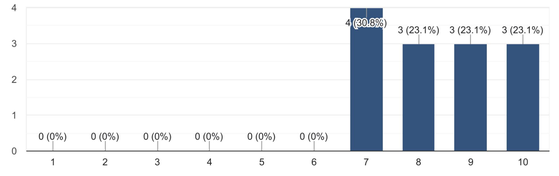

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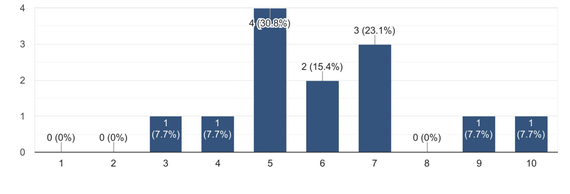

Lessons Learned

Although students appreciated receiving datasets that complemented their year-long design project, we were not able to find highly relevant scans for every team. For example, we received feedback from 2 teams working on skin related projects (skin can not be segmented in Mimics) that were given a shoulder and leg to segment. However, the team working on a modular leg splint received a broken fibula bone to segment, which paired nicely with their project.

Teams presenting in their VR headsets on showcase day.

Conclusions and Next Steps

This project has proved successful as a learning tool, but was difficult to integrate into Dr. Stegemann's graduate design course. In the future, we would like to explore the idea of creating a mini-course from this module, which would offer students enough time and instruction to fully grasp the ideas of segmentation and VR world building.

Acknowledgements

The project team gratefully acknowledges the the Associate Dean for Undergraduate Education in the College of Engineering. Without the aid of an XR Clinic grant that supported the purchase of 12 Oculus Quest 2 headsets, this module would not have been possible. We would also like to thank Bradley Tumas at Materialise Inc., Jeremy Nelson at UM's Center for Academic Innovation, GSI Obada Albaghdadi, and everyone who attended our showcase.

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