Introduction

Online education has revolutionized the way students learn by providing flexibility and convenience in accessing course materials. However, the transfer of traditional in-person education to an online learning environment may lead to decreased engagement among students due to lack of concentration in the course materials. To overcome this challenge, the use of virtual reality (VR) technology has gained popularity as an interactive and immersive tool that enhances student engagement. The purpose of this study is to investigate whether a custom-developed VR application improves student engagement in an engineering course. In particular, we compared the engagement levels of students who experienced both conventional online learning and an interaction-enhanced VR environment in a Material Handling and Plant Layout course. We focused on a single problem-solving engineering economy topic and compared a recorded video lecture version of the topic with an interactive VR-goggle-compatible mobile application. By examining the impact of VR technology on student engagement, this study contributes to the growing body of literature on the use of VR in education.

Challenges

Due to IT’s new policy, purchasing training materials has become more challenging than before. Hence, we are still trying to complete the purchase of requested training for future projects. In this regard, the current project was completely developed with our own resources, where we needed to invest more time in learning the necessary skills for C# programming within the project. Additionally, due to the end of semester and final examinations, we were able to collect only 10 in-person responses to test the application. In future, we will be collecting more data to explore if the results suggest anything new.

Data Collection, Analyses, and Results

Two-way Chi-square test was performed to explore if there is a significant difference between VR enabled decision making calculation vs video tutorial explanation. The instruction type score crosstabulation shows there were 10 correct responses vs 10.2 expected and 3 incorrect responses vs 2.8 expected count with the use of VR application. Similarly, 21 incorrect responses vs 21.2 and 78 correct responses vs 77.8 expected incorrect responses respectively with the traditional online instruction as shown on Table 1.

Table 1. Two-Way Chi-Square analysis VR vs In – Person (online tutorial) problem solving
SPSS Chi-Square Test (Table 2) shows that there was no significant difference between the two types of decision-making problem-solving calculations.

Table 2. Paired Sample t – Test analysis

<table>
<thead>
<tr>
<th>Chi-Square Tests</th>
<th>Value</th>
<th>df</th>
<th>Asymptotic Significance (2-sided)</th>
<th>Exact Sig. (2-sided)</th>
<th>Exact Sig. (1-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Chi-Square</td>
<td>.024a</td>
<td>1</td>
<td>0.878</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuity Correctionb</td>
<td>0.000</td>
<td>1</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Likelihood Ratio</td>
<td>0.023</td>
<td>1</td>
<td>0.879</td>
<td></td>
<td></td>
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<tr>
<td>Fisher’s Exact Test</td>
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<td></td>
<td>1.000</td>
<td>0.560</td>
<td></td>
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<tr>
<td>Linear-by-Linear Association</td>
<td>0.024</td>
<td>1</td>
<td>0.878</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N of Valid Cases 112

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 2.79.

b. Computed only for a 2x2 table

This study is already accepted for presentation in Palm de Mallorca, Spain this July, 2023. The PI will be traveling to present the outcomes of this preliminary results. Moving forward, we will be applying for the dissemination supplementary funds, to report more data in upcoming ATMAE conference in Atlanta, Georgia in November 2023.

Dissemination

The project will be presented in the Edulearn as shown on Figure 1. There were total number of 21 presentations and 28 presenters from various institutions, including Briercrest College, Kansas State University, Sam Houston State University, Southern Cross University, Sul Ross State University, and the University of Calgary.
Additionally, the project abstract was submitted to the Association of Technology, Management, and Applied Engineering (ATMAE) annual conference as seen in Figure 2.
Figure 2. Accepted abstract for ATMAE Annual Conference

More collected data will be reported in detail to the upcoming ATMAE annual conference in November 2023. PI and four undergraduate students from Engineering Technology, Computer Science, and Agriculture departments will be traveling to present on behalf of SHSU.

Testimonial

I would like to thank you for providing this opportunity to disseminate research outcomes, involve students, and take them to present papers at national conferences. These initiatives provide us means to collaborate and coauthor with undergraduate students from various disciplines and motivate them to conduct ethical research.