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

InstructionType * Score Crosstabulation

			Score		
			Incorrect	Correct	Total
InstructionType	VR	Count	3	10	13
		Expected Count	2.8	10.2	13.0
	In Person	Count	21	78	99
		Expected Count	21.2	77.8	99.0
Total		Count	24	88	112

	Expected Count	24.0	88.0	112.0

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

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.024[a]	1	0.878		
Continuity Correction[b]	0.000	1	1.000		
Likelihood Ratio	0.023	1	0.879		
Fisher's Exact Test				1.000	0.560
Linear-by-Linear Association	0.024	1	0.878		
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.

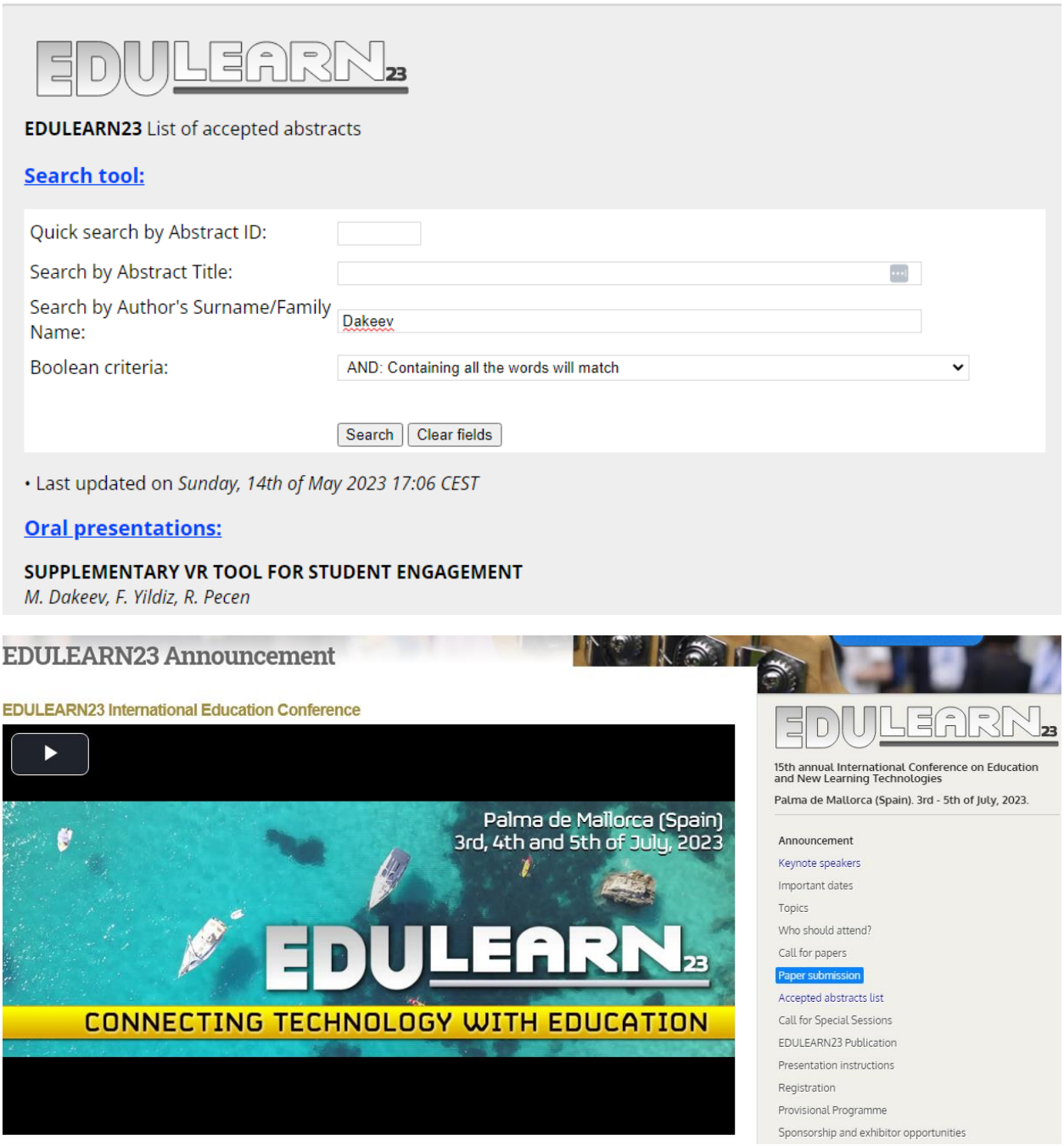
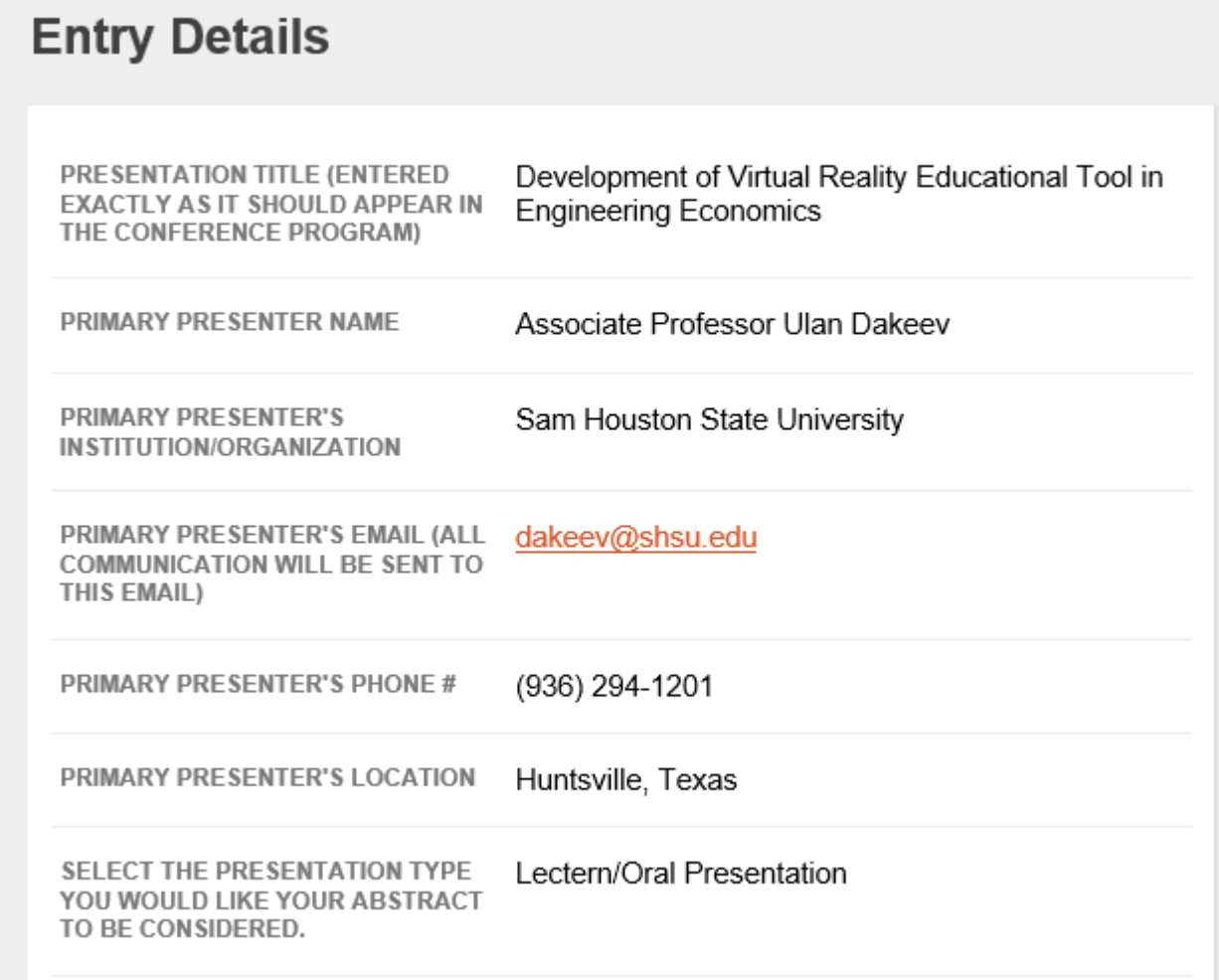


Figure 1. Edulearn23 Presentation, Palma de Mallorca, Spain

Additionally, the project abstract was submitted to the Association of Technology, Management, and Applied Engineering (ATMAE) annual conference as seen in Figure 2.



Entry Details

PRESENTATION TITLE (ENTERED EXACTLY AS IT SHOULD APPEAR IN THE CONFERENCE PROGRAM)	Development of Virtual Reality Educational Tool in Engineering Economics
PRIMARY PRESENTER NAME	Associate Professor Ulan Dakeev
PRIMARY PRESENTER'S INSTITUTION/ORGANIZATION	Sam Houston State University
PRIMARY PRESENTER'S EMAIL (ALL COMMUNICATION WILL BE SENT TO THIS EMAIL)	dakeev@shsu.edu
PRIMARY PRESENTER'S PHONE #	(936) 294-1201
PRIMARY PRESENTER'S LOCATION	Huntsville, Texas
SELECT THE PRESENTATION TYPE YOU WOULD LIKE YOUR ABSTRACT TO BE CONSIDERED.	Lectern/Oral Presentation

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.