Table of Contents

Baxley, Maxwell - #2492 - Transforming STEM Education through Immersive 3D Simulations 1
Research Proposal (authored by student) 3
Personal Statement 5
Review Form 6

Application Summary

Competition Details

Competition Title:	Spring 2024 CURO Research Award
Category:	
Cycle:	

Application Information

Submitted By:	Maxwell Baxley
Application ID:	2492
Application Title:	Transforming STEM Education through Immersive 3D Simulations

Personal Details

First Name:	Maxwell
Last Name:	Baxley
Application title:	Transforming STEM Education through Immersive 3D Simulations
UGA Student ID (81x):	811184301
Preferred Name:	Max
UGA MyID email address:	mmb54078@uga.edu
Year in school as of Fall 2023:	4th year +
Expected graduation date:	Spring 2025
Major(s):	Data Science
Major(s) College(s):	Franklin College of Arts and Sciences
Current cumulative GPA:	0.00
Are you currently a member of the Morehead Honors College?:	No
Have you presented research at the CURO Symposium? :	No

If yes, please list each year you presented

Have you previously received a CURO Research Award or CURO Research Award?:	No

If yes, please list each semester and year you received an award

Are you currently enrolled in or have you previously completed a CURO Research or Thesis course?:	No

If yes, please list courses. Include prefix, course number, and semester taken

To help us determine financial need, please explain how you are paying for tuition, and please list any financial aid or scholarships you are currently receiving, including student loans::	I have the Hope scholarship and my grandfather pays for the remainder
Faculty Mentor Last Name:	Weliweriya
Faculty Mentor First Name:	Nandana
Faculty Mentor's UGA email address:	nandanaw@uga.edu
Faculty Mentor's Department:	Physics & Astronomy
Faculty Mentor's College:	Franklin College of Arts and Sciences

Research Title

Team Lead

When and how frequently will you meet with your mentor?

I meet for 1 hour a week on Thursdays. this will pick up once we begin to create and test our simulations.

Does your research involve human subjects:	No
Type your full name below to indicate you are aware of the CITI and IRB requirements:	
Does your research involve domestic or international travel?:	No travel

Traditionally, STEM education relies on 2D illustrations to depict complex 3D real-world scenarios, often resulting in challenges that hinder understanding. This discrepancy between textbook concepts and real-world applications can lead to students' growing frustration. In order to address these challenges, we are actively engaged in an interdisciplinary project. This collaborative effort is between the UGA Physics & Astronomy Department, College of Engineering, College of Veterinary Medicine, and GSU Physics & Astronomy Department. Spearheaded by Dr. Weliweriya and Dr. Song, the primary focus of our project is the development of a series of "Scientifically Correct, Immersive, Engaging, Visually Stunning, and Modular" 3D astronomical simulations.

These simulations are designed to enhance students' understanding of fundamental astrophysical concepts. Our vision encompasses nearly two dozen distinct topics where 3D simulations can significantly import students' interest. For example, our simulations allow us to create accurate models of the Sun, Earth, and Moon in their orbits, enabling students to simulate solar and lunar eclipses.

Our simulations are adaptable and cater to various educational settings. With a simple QR code displayed in the classroom, students can easily engage with these simulations, facilitating a deeper understanding of esoteric subjects. Our ultimate goal is to develop interactive VR simulations that can be assigned as practical labs. As we proceed with this project, it is important to assess the effectiveness of our simulations. We will test simulations against several critical factors, including testing students' understanding of concepts, collecting valuable user feedback, comparing the efficacy of our simulations with other instructional methods, and evaluating their technical performance.

In my role within this project, I am engaged in a crucial task that supports the development of these simulations. My current focus is on analyzing 3D Software Development Tools to identify the most suitable tools and engines for each topic. I have assembled a comprehensive list of engines, including Unity and Unreal 5, with detailed notes and recommendations for each as well as testing said engines. For the remainder of the semester, my goal will be to conduct a comprehensive comparison of these tools and engines to further inform my recommendation.

Looking ahead to the spring semester, my focus will shift towards completing the comparison and using the findings to draft a research article. This article will be submitted to a prestigious peer-reviewed journal, such as the ASEE. Through this research publication, we aim to share our innovative findings and contribute to the ongoing transformation of STEM education.

I just transferred here (fall 23) for the research opportunities. I am majoring in Data Science with a real interest in Astronomy. I eventually want to work as a researcher in astronomy. Once I graduate, in the spring of 2025, I plan to stay here to get my Ph.D. in statistics or a related field. Since my skillset is in computers and mathematics, and not astronomy or astrophysics, I would like to help analyze data, create simulations, and manage data. I have yet to decide exactly what interests me the most within the field of astronomy or even what exactly I want my role to be. This research project will help with those decisions.

I believe this research team will help me reach these goals. I will acquire useful skills like learning how to use and navigate simulation software. This will give me hard skills like coding and 3D design as well as soft skills such as storyboarding, cross-platform integration, and the nuances of publishing an academic paper. It will also give me experience working with VR software and hardware, which I believe will be very important in the decades to come. This project will also give me experience working with data. A few of the simulations involve using real-world data such as mapping near-earth objects and plotting their orbits, mapping constellations at different times in human history and showing how they have changed, and creating a virtual planetarium with accuracy. All of these involve integrating real-world data; as the only undergraduate member with data science experience, it will be my job to help organize these.

Review Form

Spring 2024 CURO Research Award

Routing Step:	Faculty mentor UGA email address
Application Title:	Transforming STEM Education through Immersive 3D Simulations
Application ID:	2492
Review Deadline:	11/10/2023 11:59 PM

***Your Comments:**

--

***Please indicate whether you approve or do not approve this application moving forward in the competition.:**

--