

Final Report

Accomplishment under the 2023 Provost Affordable Course Material Grant

This project is to replace two commercial textbooks for ASTR 1010, 1110, and 1420 with OpenStax textbook. These courses attract about 300 students in a typical academic year. When we first tried to use the OpenStax Astronomy textbook (“Astronomy” ISBN-10: 1-947172-24-7) in AY2019 with the support from the AY2019 Affordable Learning Georgia (PI: Song) and 2022 Provost’s Affordable Course Material grant (PI: Song), we found out that the textbook significantly fell short for illustrations (such as graphs, pictures, simulations) in quantity and quality. While offering no/low-cost courses to students is important, it is also critical to keep students engaged in the course through high-quality open education resources. As a result, we went back to the commercial textbooks.

With the AY2023 Provost Affordable Course Material grant, we started a project to create about two dozen 3-D astronomy models. The aim was to develop a set of “Scientifically correct, Immersive, Engaging, visually stunning, Modular” 3-D astronomical simulations to enhance students’ understanding of fundamental astrophysical concepts. Developed models can be rendered into many different platforms including static or dynamic 2D illustrations, 3-D models, or augmented reality projections. With these simulations, the adoption of the free OpenStax textbook for multiple astronomy courses can be accomplished fully and be sustained in the future.

With the support of AY2023 Provost ACM, we finished the development of two models and three models are close to be fully developed (completion date of 2025 February). We will use the developed models in 2025 ASTR 1420E (summer) and 2025 fall ASTR 1010 and ASTR 1110. The list of all 3-D astronomy models and their current progress statuses can be checked from [this link](#).

Fully developed models:

- Solar Cycle (demonstrating the solar rotation and changing sunspots)
- Orbital Elements (demonstrating the six Kepler orbital elements)

In Active Development:

- Virtual Night Sky (about 2/3 finished)
- Solar-Lunar eclipses (about 2/3 finished)
- Solar System Overview (about 50% finished)

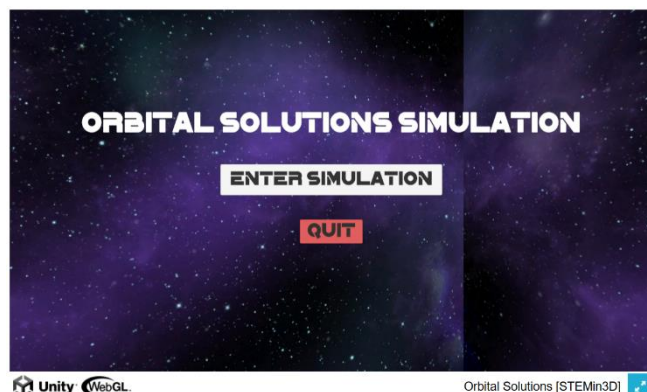


Figure: Screenshot of the Orbital Elements simulation. Clicking the figure will take you to the Web rendered version of the model.