Adoption of the free OpenStax textbook for multiple astronomy courses
(Physics & Astronmy)

Background and Implementation Plan:
ASTR 1010, 1110, and 1420 are introductory level astronomy courses offered by my department, and about 300 students are taking these courses in a typical academic year. Two commercial textbooks are used currently, and they are "Cosmic Perspective" by Bennett et al. ($75) and "Life in the Universe" by Bennett et al. ($105). Through the AY2019 Affordable Learning Georgia (PI:Song) and 2022 Provost's Affordable Course Material grant (PI: Song), with my other astronomy colleagues, my department tried to adopt the OpenStax textbook ("Astronomy" ISBN-10: 1-947172-24-7). This textbook turned out to be adequate in terms of topic coverage, however, it 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.

Now, several colleagues in my department started a STEM education improving project called STEMin3D[1]. As part of this multi-disciplinary project, I am leading effort to develop a set of "Scientifically correct, Immersive, Engaging, Visually stunning, Modular" 3-D astronomical simulations to enhance students' understanding of fundamental astrophysical concepts. We plan to develop ~20 high quality simulations that can turn into static 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. Because of the page limit, I cannot list all these ~20 selected topics, but reviewers of this proposal can access the list from this link.

Related courses and latest student enrollment data : total saving ➔ $22,080/year

Course	Students summer	Students 2023 Fa	Students 2023 Sp	Students (year)	Total saving/yr
ASTR 1010 Astronomy of the Solar System	0	115	48	163	$12.225
ASTR 1110 Intro Astronomy for Majors	0	32	0	32	$2,400
ASTR 1420 Life in the Universe	30	41	0	71	$7,455

Budget: I request $5,000 to support undergraduate student programmers. 3-D astronomy models we intend to develop are created using real time 3D softwares such as Blender or Unity, and undergrad students are developing Blender models based on a faculty-created simulation requirement document for each topic. We will use the fund to pay several undergrad students at an hourly rate of about $12. Three students are currently working on this project, and we plan to hire more students.

[1] https://STEMin3D.net or https://cosmos.physast.uga.edu/VRedu