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Project Title: Building an Understanding of Astronomical Sizes and Scales with WorldWide Telescope
Principal Investigator: Dr. Edwin Ladd, Associate Professor Physics and Astronomy
Co-PI: Dr. Katharyn Nottis, Professor of Education
Funding Agency: National Science Foundation (NSF)
Award Amount: $199,961
Award Period: 2012-2015

The concepts of size, scale, and structure extend beyond topical boundaries in STEM disciplines. From the smallest scales of nuclear and atomic physics, to the hidden geometry of Earth's crustal plates and faults, to the gargantuan scale of our universe, students are challenged to visualize and comprehend unseen and inaccessible geometries. NSF is funding Drs. Ladd and Nottis to create, test, and distribute new curricular materials to deal specifically with these issues in an astronomical context.

This project will integrate the WorldWide Telescope (WWT) astronomy visualization environment into the hands-on laboratory programs in undergraduate general education astronomy courses. The new lab activities will allow students to investigate the essential ways astronomers measure distance in our universe in an interactive 3-D visualization environment with real astronomical data. Gains in student understanding will be measured using research-validated concept inventories and other qualitative assessments. Once the curricular materials have been shown to be effective in reducing student misconceptions, they will be made widely available, along with associated documentation, to the Astronomy 101 teaching community.

Broader impacts from this project include that three dimensional visualization and spatial reasoning skills have been shown to be critical for success not only in STEM careers, but also in careers not directly involving science and technology. For undergraduate students not majoring in a STEM discipline, a general education astronomy class may provide their only college experience in 3-D spatial visualization. Therefore, this project brings powerful spatial visualization software to the undergraduate general education classroom, and will help non-science students develop spatial reasoning skills while forming a more accurate map of their natural surroundings.

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