

SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)
On Track - Undergraduate Space Education (3)

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HUNTING FOR HABITABLE WORLDS: ENGAGING STUDENTS IN AN ADAPTIVE ONLINE
SETTING**Abstract**

The field of astrobiology, through its breadth of scope and high level of public interest, offers a unique prospect for introductory science curricula, particularly at the undergraduate level. Traditional university-level science instruction consists of lectures and lab courses both of which are fact-focused and highly scripted to emphasize correct replication of results rather than inquiry-driven exploration. These methodologies give students the impression that science is an authoritative list of concepts and experimental results requiring memorization, rather than a methodology for narrowing uncertainties in our knowledge. Additionally, this particular class structure does not take advantage of many new and emerging online multimedia technologies.

To address these shortcomings, we have developed "Habitable Worlds", an introductory-level course offered online through Arizona State University. The course was delivered online in the Fall 2011 and Spring 2012 semesters to 150 students each. This course is built around the Drake Equation, which allows us to introduce non-science students to the basics of scientific thought and methodology while exploring the disciplines of astronomy, geology, biology, and sustainability in an integrated manner. The course is structured around a habitable-worlds hunting quest, in which each student is provided with a unique sky of stars and tasked with finding habitable worlds around these stars. In order to successfully complete this mission, students work their way through the course curriculum via interactive exercises that focus on the discovery of basic scientific concepts followed by the mathematics and models that explain them, hence inverting the lecture-lab paradigm.

The "Habitable Worlds" course is built on Smart Sparrow's Adaptive eLearning Platform (AeLP), an educational technology that provides a "tutor over the shoulder" learning experience for students. Students are engaged via rich interactions using scientific simulations developed by us and are provided with intelligent and adaptive feedback and lesson structures based on their interactions. Advanced students can proceed quickly and are kept engaged, while students with difficulty can try alternative approaches or receive appropriate remediation. The AeLP's analytics engine allows us to explore large datasets of students' interaction, which has assisted in identifying problematic concepts or flaws in instructional design. Subsequently, we have further adapted and improved the content of the course.

This adaptive astrobiology course, targeted at a general education audience and which additionally provides data on student interaction and misconceptions, is part of the NASA Astrobiology Institute's virtualization efforts as well as ASU's efforts to broaden online offerings to include rigorous scientific curricula.