INCREASING THE IMPACT OF COURSEWORK THROUGH DEEP ANALYTICS. Horodyskyj, L.[1], Buxner, S.[2], Schönstein, D.[3], Semken, S.[1], and Anbar, A.[1], [1]School of Earth and Space Exploration, Arizona State University, Tempe, AZ 85287, [2]Teaching, Learning, and Sociocultural Studies, University of Arizona, Tucson, Arizona 85721, [3]Smart Sparrow, Sydney, Australia.

Introduction. Over the past few years, Arizona State University has developed the online astrobiology lab course *Habitable Worlds*, which has been offered to over 1,500 students over seven semesters. The course is offered through Smart Sparrow's intelligent tutoring system, which records student answers, time spent on each activity and question, simulation setups, and additional data that we refer to as "analytics". As the development of the course has stabilized, we have been able to devote more time to analyzing these data, extracting patterns of student behavior, and how they have changed as the course has developed.

Concept Mastery and Attitudes Towards Science. For the last two years, we have administered a variety of pre- and post-tests to measure changes in student attitudes and concept mastery during the course of the term. Using the Classroom Undergraduate Research Experience (CURE) survey, we are analyzing our students' beliefs and attitudes about science both before and after the course, and looking at relationships between these outcomes and student behaviors and success. Various concept tests allow us to evaluate the effectiveness of course material. Combined with deep analytics, which allow us to investigate student behaviors and answers as they navigate specific activities, we can quickly identify strengths and weaknesses in both students and activity design. The flexible authoring platform through which *Habitable Worlds* is developed and deployed allows us to quickly edit and update content for subsequent deployment and comparison to previous terms.

Early Warning Systems. Most recently, we have evaluated the behavior of students in terms of starting days relative to release and deadline and completion rate of various activities and compared to a variety of demographic factors. Not surprisingly, behavior and ultimately success in the course is closely associated with final grade. Surprisingly, these patterns of behavior are statistically distinguishable as early as the first week of class. Using this information, we have developed and deployed an early warning system during the Spring 2015 term and will discuss effectiveness of this system in changing student outcomes.

Science Reasoning Abilities. Analysis of multiple semesters of course data has revealed deficiencies in lesson design, which have informed subsequent redesign efforts. Yet despite significant gains in content knowledge, we have failed to make gains in students' high-level concept comprehension. There are many points of failure between basic information and true concept comprehension, which we are currently not tracking. The intelligent tutoring system allows us to develop a suite of generalized tools and activities that can be deployed in any context that can score a student's abilities in various core competencies, before, during, and after a course to provide deeper insight into problematic skills for individual students.