Identifying and Mitigating Student Behaviors that Lead to Failure

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SES 106: Habitable Worlds
Organized around the Drake Equation, “SES 106: Habitable Worlds” is a 4-credit online-only fully interactive astrobiology lab course that teaches astrobiology as an integrative science, covering topics from stars to civilizations. This course is a digital native, built using Smart Sparrow’s Adaptive eLearning Platform (AeLP), which gives the instructor the power to set the content of the stage, granularity of feedback, and adaptive pathways. The system provides robust data and analytical tools that allow us to investigate how students interact with the exercises, both in aggregate and at the individual level.

Day of Start
Course materials consist of weekly “training” exercises on topics related to a theme, coupled with “application” exercises to test abilities to apply skills acquired in training exercises. Number of training exercises per week varies from 4 to 6. They

Start vs. Final Grade
Start vs. On Campus/Remote
Start vs. Academic Level

To teach basic concepts, we build our lessons (using text, video, and simulators to illustrate concepts) and adaptive feedbacks and pathways in the AeLP.

Common pathways and errors are analyzed afterwards to identify problematic areas and assist in redesigning the lesson.

- Strongest correlation between start day and grade
- Day-of-start behavior evident and statistically distinguishable in Week 1 of course
- “A” students overwhelmingly start earlier
- “D” students start earlier in week 1, but falter as the class progresses
- “E” (failing) students start late and fall further behind as the class progresses
- “W” (withdrawing) students start late and disengage

DEW students show distinctive behaviors that are evident very early in the term. D students seem aware of their weaknesses but can’t overcome them. E students are faltering throughout. W students disengage without trying.

- Weak correlation between start day and academic level
- Sophomores/Juniors tend to start earliest

Student Behavior Analysis and Intervention
Science literacy is increasingly important in day-to-day life in the modern world. For many students, a gen-ed science course in college is their last formal interaction with science, hence student retention is important if we’re interested in training a science-literate public. Towards that end, we have investigated day-of-start and completion rate of activities in the HabWorlds curriculum and whether they correlate with student performance and other demographic information. Based on the results that we found, we devised and tested a simple intervention to see if we could affect the outcomes we predicted based on previous behavior in the course.

Completion Rate
All course content is available for at least seven full days and there are no time limits while students are working on the content (aside from the week-end deadline). Material is designed to be challenging and students cannot proceed to the next activity in the exercise until they have successfully completed the preceding content. Students are supported through their struggles via a robust discussion platform (Piazza, www.piazza.com) where students and instructors interact and assist each other through challenging concepts.

DEW Behavior
- D students complete most work, struggle on application and project materials
- E students struggle significantly, but continue to engage material from week to week
- Withdrawing students disengage after hitting one or two difficult spots in training activities
- “Drop” students represent all who add, then drop after course appears in course catalog (9+ months from start)

While the students who withdraw and drop are a lost cause, the majority of students who fail the course are not. With proper engagement and support, these students can be assisted, especially if we can identify these students quickly.

Intervention
During the Spring 2015, we implemented an “early warning” intervention system. A student was deemed “at risk” if less than 50% of training exercises remained incomplete or unstarted 72 hours before the deadline. The cohort was randomly divided into A and B groups. An “at risk” student in the A group received a personalized e-mail, while the B group did not.

- 50% open rate, negligible response rate
- No statistically significant difference in behavior or effect of intervention between A and B groups

Students who are most “at risk” of failure are aware of their shortcomings and begin to tune out our warnings. A more active intervention strategy may be necessary to help these students succeed.