

Planning Process for Implementation of ALEKS Adaptive Learning Software in Introductory Mathematics and Statistics Courses

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BACKGROUND

Introductory mathematics and statistics courses often serve as obstacles to student success and degree completion. Students enter these courses with various levels of prior mathematical knowledge, but traditional classroom instructions and assignments do not take this fact into account.

Therefore we are attempting to impact student learning and success by addressing the diverse mathematical backgrounds of the students with the help of interactive adaptive learning software. One such software is ALEKS, which stands for “Assessment and Learning in Knowledge Spaces.”

The ALEKS adaptive learning platform analyzes each students’ current mathematical knowledge and delivers personalized online mathematical instruction. It uses artificial intelligence to determine what each student knows, what each student does not know, and what each student is most ready to learn.

Other positive characteristics of the efforts include periodic or scheduled adaptive knowledge checks that identify gaps in student understanding and offer built-in remediation, an open-response environment that allows keyed entries rather than multiple-choice answers, and immediate feedback that includes step-by-step explanations.

PLANNING APPROACH

The process began by examining different adaptive learning platforms and, based on its readily available rich mathematics and statistics content, ALEKS was chosen for the pilot.

A set of topics was identified for each course that align with the learning objectives. Through a number of meetings with ALEKS representatives, we created “sandbox” courses that allowed us to select individual topics and experience the courses as a student. For example, we were able to take the initial knowledge check as a student. Based on our responses, the platform assigned us a set of exercises including some remedial tasks to bridge the gap from the current level of understanding to the needed level. After this review, we incorporated the “sandbox” courses into the Spring courses for student use.

The manner in which we plan to measure the achievement or success of students includes the outcome of ALEKS assessments along with traditional assessments of in class work, quizzes, tests, and a final exam. The ALEKS assessments consist of precise and comprehensive delineation of an individual’s competence in the form of his or her knowledge state describing not only the types of problems mastered by that individual, but also a comprehensive list of the topics the individual is ready to learn.

SPRING 2019 PILOT COURSE

ALEKS is being piloted in Spring 2019 with two large sections of Stat 1220 – Introductory Statistics as well as in one section of Math 1102 – Introduction to Mathematical Thinking.

The Introductory Statistics course is non-calculus based and includes topics such as data summarization, discrete and continuous random variables, sampling, central limit theorem, estimation, testing

hypotheses, and linear regression. Applications of theory in this course are drawn from areas related to business as a large proportion of students taking the course are business majors. The two sections of statistics using ALEKS contain 80 and 120 students, respectively.

The Introduction to Mathematical Thinking course is designed primarily for non-STEM students, and topics include flavors of algebra, geometry, number theory, probability, statistics and graph theory. The section of the course using ALEKS consists of 40 students.

DISCUSSION

Challenges that arose in the planning process:

- Nested topics in the software template did not directly align with all of the learning objectives. As an example, Chebyshev's Theorem and the Empirical Rule are grouped together in the software. This means that both topics must be taught in the course even though one of these is optional in this statistics course.
- The explanations provided to students when they answer an exercise incorrectly may not align with how the topic is taught in the textbook or in class. This can create some confusion for students.
- Students who procrastinate and do not stay on track with periodic goals may find themselves overwhelmed. Therefore constant encouragement and reminders are important.
- We need to be mindful of the software costs to students.