

Arizona State University Case Study

Phoenix, AZ



Study Specifics

School Name Arizona State University

Educator Douglas Williams

Course Name Math 117 College Algebra / Academic Years 2015-2017

ALEKS Implementation 16-weeks; Blended (Lab + Group Work)

Enrollment 3200 for Fall; 1000 additional in Spring

Introduction

In 2013 Arizona State University (ASU) identified a growing trend of more students being placed into their lower-level mathematics courses, namely Freshman Enhanced Mathematics (MAT 110). While ASU was dedicated to supporting these students, they were also concerned that their success in MAT 110 was not translating into success in College Algebra (MAT 117). Pass rates in College Algebra were stalling at around 60%. This led faculty to reconsider the learning tools for Enhanced Freshman Math and College Algebra.

ASU tried a number of instructional systems for the Enhanced Freshman math and College Algebra courses prior to evaluating ALEKS. While students were able to progress at their own pace, their efforts were not meeting ASU's expectations for improved success on exams.

The inadequate progress, along with the desire to get more students through College Algebra, drove ASU to seek alternative software to deliver course material.

ALEKS Experience

After evaluating the courseware options and pedagogical considerations, faculty decided to pilot ALEKS in the College Algebra course for the summer of 2016. As part of the preparation for the pilot, the faculty tried ALEKS as students. They saw the benefits of its adaptive nature and built-in motivation and realized that this would be a more personalized experience for their students.

In the fall of 2016, ASU faculty launched two initiatives:

- ASU would no longer offer Enhanced Freshman Mathematics. Students who would have placed into that course would enroll in College Algebra.
- ALEKS would be implemented to remediate students who lack prerequisite skills in College Algebra.

College Algebra pass rates then increased after the first semester with ALEKS from 62% in the fall of 2015 to 67% in the fall of 2016, and again to 74% in the fall of 2017. Instructors were pleased that their initial hypothesis of lower pass rates was incorrect. ASU believes that ALEKS is a significant part of this success in College Algebra. The adaptive nature and algorithmically generated problems in ALEKS tailor the lessons so students are on their own individual path. The precision at which ALEKS can remediate students' prerequisite skills, as well as regular course content, led to a radical departure from the national practice of instructors lecturing students in class.

Implementation

ASU designed a blended model to support student learning in College Algebra. ALEKS Placement, Preparation, and Learning (ALEKS PPL) is used to place students into the course, which is organized into cohorts of 25 students that are each managed by an undergraduate learning assistant. The class meets three days a week in a lab to work in ALEKS. Once every two weeks students work on problem-solving activities in groups of 5-6 students. There are 18 ALEKS Objective assignments, each with a varying number of topics, and the first few Objectives are frontloaded with review topics. Grades are weighted according to the syllabus: ALEKS Pie progress = 20%, weekly ALEKS topic goals = 15%, exams = 50%, participation = 5%, problem-solving activities = 10%. Students receive a letter grade at the end of the semester.

The ALEKS reporting metrics are used to monitor student progress and identify those who are falling behind. Faculty can then help these students remediate effectively. Three tests and the final are in ALEKS and proctored by Software Secure's Remote Proctor Now, which is licensed by ASU. It is also important to note that ASU has supplemented the ALEKS system with instructional videos that have helped many students to learn the lessons in the courseware.

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The interface is very intuitive and the appropriate metrics needed to identify student progress are readily available. These metrics make it very easy for instructors to identify students that are falling behind and then offer them the appropriate level of support to help them be successful."

 Doug Williams, Instructor & Adaptive Learning Coordinator

Consolidating Courses

Students who would have placed into Freshman Enhanced Mathematics now enroll directly in the appropriate credit-bearing courses and use ALEKS as the primary instructional tool. Students enrolled in College Algebra are encouraged to complete the course within one semester. Most students are able to complete in one semester what would have taken two semesters in prior years. However, instructors review all progress in ALEKS about two thirds of the way through the semester and determine which students may need more time to complete. This is often the case when a student spends a significant portion of the semester on remedial topics. After working with the ASU registrar, the math department developed a system to allow the struggling students to earn a "continuation grade" (Z) in their class and then finish College Algebra the following semester in a "stretch" course (117S).

Fall Semester Success Rates

Prior to using ALEKS, the College Algebra pass rates were often hovering around the 60th percentile. After ALEKS, student success in College Algebra jumped to 67% in the fall of 2016 and up to 79% in the fall of 2018; this is in spite of students who would have placed into Enhanced Freshman Math being mainstreamed into College Algebra (see Figure 1). The success rate for the fall of 2017 increased to 78% once the adjustment is made for the students who chose a Z grade and then completed the stretch course successfully. ASU also saw 670 more students pass College Algebra in the fall of 2016, compared to when Enhanced Freshman Math was a prerequisite the year before. An additional 280 students passed College Algebra within one year via the stretch course path.

Figure 1 College Algebra Data

Fall Term	Pass Rate	Enrollment
2015	62%	1,655
2016*	67%	2,534
2017	74%	2,700
2018	79%	4,546

*First semester with ALEKS



One Year Success Rates

Prior to ALEKS, students with low placement scores passed College Algebra only about 45% of the time, which is about a 20 percentage point gap compared to those with satisfactory placement scores (see Figure 2). In the academic year 2016-17, about 83% of the students with satisfactory placement scores passed while students with low placement scores eventually passed at a rate of 74%. This represents substantial improvement for both groups while also closing the achievement gap from 20 to 9.5 percentage points.

Figure 2

One Year Pass Rate for College Algebra Students

Placed Below College Algebra
Placed into or Above College Algebra



Results

To determine the success of the new setup for College Algebra, ASU measured the pass rates of students for the fall semester, and then the pass rates of students who took two semesters to complete College Algebra via the stretch course (117S). This was done by noting the number of Z grades from the fall semester that converted into passing grades the following spring semester.

The changes in enrollment numbers (see Figure 3) show that significantly more students are completing in one semester what many took over two semesters in previous years to complete. Not only does this show students are saving time, but they are also saving money by only having to pay for one course instead of two. Within just one semester, students saved over \$1 million in tuition and course fees. Getting more students through College Algebra in less time is critical to achieving the goal to eliminate math as a "rate limiter" for student success in STEM and other areas of study.

Figure 3

College Algebra Enrollment

	AY 2015-2016 without ALEKS	AY 2016-2017 with ALEKS
Starting Enrollment	1,655	2,534
Pass in 1st Semester	994	1,644
Pass in 1st Year	1,575 (58%)	1,987 (78%)

Student Proficiency

ASU also uses ALEKS to measure the proficiency for each of the 380 learning objectives in College Algebra; the rule the faculty set is 90% mastery to move on to the next lesson. In the fall of 2016, students who completed College Algebra achieved 95.6% mastery. The technology to measure mastery at such a granular level did not exist prior to using ALEKS. The ASU faculty believes that improved student performance has largely to do with student use of the just-intime resources in ALEKS. Students dedicated to learning really benefit from the adaptive design of ALEKS.

Student Reactions

Based on surveys and focus group feedback conducted by ASU, students in general like ALEKS. They like that the Knowledge Checks give them the opportunity to skip ahead in the content. They also find the system easy to navigate. Getting double credit in Learning Mode for getting multiple problems right in a continuous streak has been a big motivator for students. Instructors have noted that students are more proactive and take ownership of their success in the course, which they believe is attributable to the user experience in ALEKS.

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ALEKS is a very motivational tool. I learned what was being asked of me. I had to repeat many topics, but that allowed me to really understand the steps to solving problems."

– Student, Arizona State University



Institution Profile

Arizona State University (ASU) is a top-ranked, public research university that spans five campuses in the Phoenix metropolitan area, and four regional learning centers throughout Arizona. It serves over 100,000 students and graduates more than 20,000 thinkers, innovators and master learners every year. The university's charter is based on the "New American University" model created by ASU President Michael M. Crow, which defines it as a "comprehensive public research university, measured not by whom it excludes, but rather by whom it includes and how they succeed."

For the fourth straight year, U.S. News & World Report ranked ASU No. 1 on its "Most Innovative Schools" list.

Instructor Profile

Douglas Williams began teaching in Belize in 1981. He earned a Bachelor's degree in Secondary Education from University College of Belize, and a Master's degree in Statistics from Arizona State University. Professor Williams began teaching fulltime at ASU in 2000 and as an adjunct at Gateway Community College in 2002. He has taught various undergraduate math, math education, and statistics courses using traditional, hybrid, online, and adaptive designs. Professor Williams also has served on various department committees for course redesign. Since 2012 he has been the Adaptive Learning Coordinator for all of the ASU College Algebra and College Math courses. He leads the team that implemented several adaptive platforms, including ALEKS.

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