Case Study

Arizona State University (ASU)

Contents

About the Contributors

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About the Supporting Organizations

Every Learner Everywhere is a network of twelve partner organizations with expertise in evaluating, implementing, scaling, and measuring the efficacy of education technologies, curriculum and course design strategies, teaching practices, and support services that personalize instruction for students in blended and online learning environments. Our mission is to help institutions use new technology to innovate teaching and learning, with the ultimate goal of improving learning outcomes for Black, Latinx, and Indigenous students, poverty-affected students, and first-generation students. Our collaborative work aims to advance equity in higher education centers on the transformation of postsecondary teaching and learning. We build capacity in colleges and universities to improve student outcomes with digital learning through direct technical assistance, timely resources and toolkits, and ongoing analysis of institution practices and market trends. For more information about Every Learner Everywhere and its collaborative approach to equitize higher education through digital learning, visit www.everylearnereverywhere.org.

Association of Public and Land-grant Universities (APLU) is a research, policy, and advocacy organization dedicated to strengthening and advancing the work of public universities in the U.S., Canada, and Mexico. With a membership of 244 public research universities, land-grant institutions, state university systems, and affiliated organizations, APLU's agenda is built on the three pillars of increasing degree completion and academic success, advancing scientific research, and expanding engagement. Annually, member campuses enroll 5 million undergraduates and 1.3 million graduate students, award 1.3 million degrees, employ 1.3 million faculty and staff, and conduct $49.2 billion in university-based research.

Introduction

Arizona State University (ASU) is a pioneering higher education institution driven in large part by the successful implementation of educational technology in a variety of disciplines to serve more students efficiently, improve learning outcomes in courses, and provide more personalized student support. For the past five years, ASU has been rated as the #1 Most Innovative School/ National University by U.S. News & World Report.

ASU's teaching and learning successes have been enhanced by increased adoption and implementation of adaptive courseware, formed by its early piloting of adaptive learning in 2011. This foundational work is especially important today as the use of digitally enhanced modalities of teaching and learning becomes increasingly widespread due to the COVID-19 pandemic.

The entire adaptive learning implementation process is managed by teams of project managers in collaboration with course and academic leads, instructional designers, vendor account managers, various executive-level sponsors, student and technology support services, research and analytics professionals, and other stakeholders. Team members take direction from and coordinate with project managers, who are responsible for leading meetings, planning, documenting, and communicating with stakeholders during every phase.

Adaptive courseware products have been instrumental in the redesign of ASU gateway courses. Adaptive courseware technologies are necessary but not enough to ensure success based on powerful software capabilities alone. **It is vitally important to realize that substantial faculty training in an interactive and collaborative learning pedagogy, in tandem with understanding how to effectively utilize adaptive analytics data from student assessment outcomes, are crucial for achieving positive results.**

Case Study: Arizona State University (ASU)

In this case study, Arizona State University shares the progress of their adaptive courseware implementation, as well as lessons learned — emphasizing the importance of faculty development and support.

Key Takeways

- The APLU grant has catalyzed an increased effort to decrease the lecture as the predominant form of teaching.

- Faculty training in active learning pedagogy, as well as an understanding of how to effectively utilize adaptive analytics data, are crucial for positive results.

- Stakeholders at all levels must all work together in agreement to bring about student success.

- Five rules for success:

  - Define clear and measurable goals for your program.

  - Gather data on the current situation to make a strong case for change.

  - Build a leadership team for the program that includes representatives from all academic levels.

  - Invest in faculty development so they can use the adaptive + active approach effectively.

  - Start small and seek an early success so you can build confidence in the process.

About the School and Grant

Arizona State University (ASU) is a comprehensive public research university with five campuses throughout metropolitan Phoenix. A Fall 2019 enrollment of 121,000 students included 50,000 students enrolled in fully online undergraduate and graduate programs, while 12,000 graduate students and 59,000 undergraduate students attend classes across its campuses. 36% of the student population are Pell grant recipients, 50.4% are non-white, and 23.5% of entering freshmen are first-generation students.

ASU was awarded the Accelerating Adoption of Adaptive Courseware Grant in 2016 to scale the use of adaptive and other innovative technologies in order to improve student success in general education courses. The grant is administered by the Personalized Learning Consortium at the Association of Public and Land-grant Universities (APLU) and is generously funded by the Bill & Melinda Gates Foundation.

Adaptive courseware technologies are powerful but must be coupled with other critical course pedagogical changes.

Substantial faculty training in how to effectively utilize adaptive analytics data from student assessment outcomes is required, and faculty must also learn active learning pedagogy. Both approaches are crucial for achieving improved student pass rates.

Adaptive courseware can provide keen insights into student learning regardless of where that learning takes place. Online, blended, and face-to-face teaching and learning environments can all be enhanced through the adoption and implementation of adaptive technologies.

The overriding goal is to meet and engage with student learning where they are.

Goal

ASU's institutional strategic goal to increase freshman retention rates to 90% became the driving force for adopting adaptive courseware and pedagogy. In addition, an analysis of general education courses with large enrollments (more than 1000) and high failure rates became the impetus for ASU to employ an adaptive and active learning *flipped classroom* approach, starting with nine introductory courses. Flipped learning, which is used regularly as part of digitally enhanced learning, involves introducing course material prior to when students attend class and making actual class time focused on peer-and-teacher discussions and problem-solving activities.

Approach

ASU ultimately built an adaptive learning system that delivers instructional resources and data focused on each student's individual progress and learning needs, enabled by pedagogies that can be modified in real time. Students access content and learning activities that they need, when they need it. They are supported through active learning exercises that emphasize collaboration, communication, critical thinking, quantitative reasoning, and creativity.

Case Study – Arizona State University (ASU)

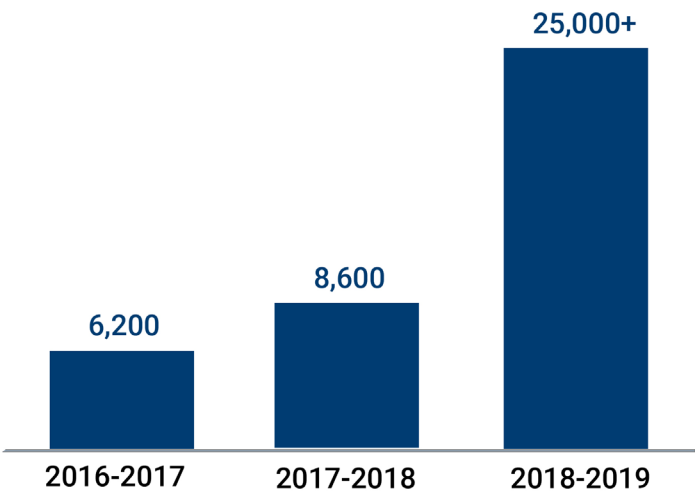The following nine redesigned courses are part of ASU's entry into the APLU grant program:

Course	Adaptive Courseware Provider
Introduction to Biology	CogBooks
Macroeconomics	Difference Engine by Learning Objects - Cengage
Microeconomics	Difference Engine by Learning Objects - Cengage
United States History to 1865	CogBooks
United States History since 1865	CogBooks
College Algebra	McGraw-Hill Education ALEKS
College Math	McGraw-Hill Education ALEKS
University Physics: Mechanics	Pearson MyLab & Mastering, with Knewton
Introduction to Psychology	Difference Engine by Learning Objects - Cengage

Additional courses in Astronomy, Philosophy, and Pre-Calculus are currently under development.

A total of 44 course sections implemented adaptive courseware systems through the APLU Grant during the Fall 2016–2017 academic year. The implementation rate increased to 65 course sections by the Fall 2019 semester.

The APLU grant enabled ASU to serve more than 25,000 students in redesigned gateway courses in the 2018–2019 academic year, up from 6,200 students enrolled in APLU grant-supported courses in 2016–2017.

Students enrolled in APLU grant-supported courses

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                                                      25,000+
                                                      ▉
                                         8,600        ▉
                            6,200        ▉            ▉
                            ▉            ▉            ▉
                         2016-2017    2017-2018    2018-2019
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The APLU grant has greatly accelerated the number of courses offered in an adaptive format and has permitted greater advancement of the relevant technology. The Provost Office and the University Technology Office have partnered in building a bridge between technology and teaching and learning through a new initiative at ASU called the Innovation Collaboratory. The Collaboratory is adopting new approaches to teaching and learning that call for updated physical and digital spaces. Key to the Collaboratory's success is the creation of next-gen learning environments that are configurable and adaptive spaces for interactivity, group work, and hands-on activities where people can customize the space based on the activity.
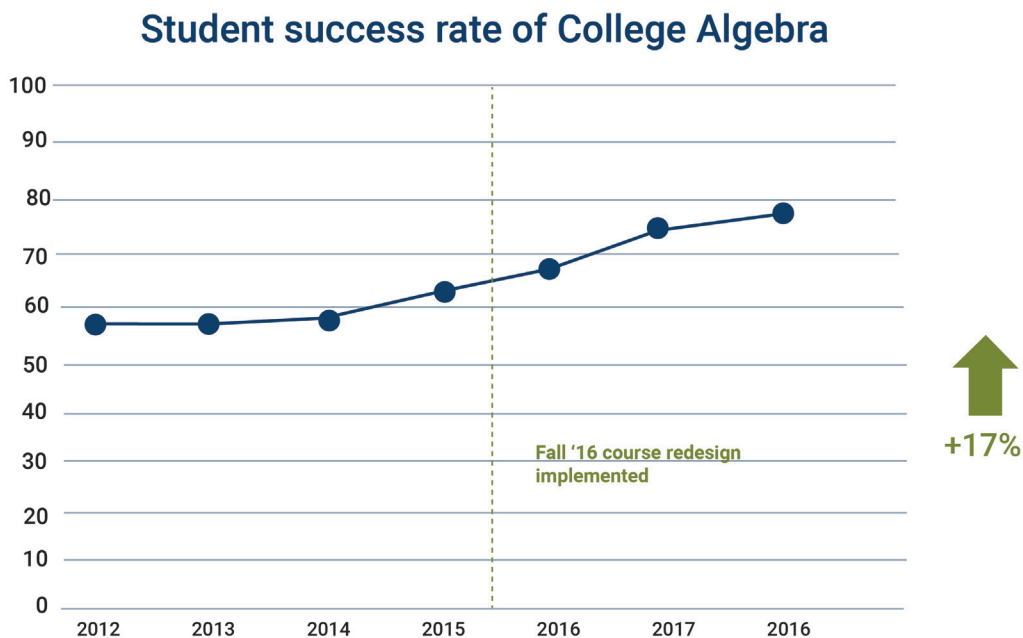
Additionally, while ASU's Provost Office and the APLU grant have provided significant development and support staff and funding for adaptive learning, some academic units are starting to invest their own funds in the process. For example, the School of Life Sciences has hired staff to provide faculty training and coordinate their efforts to align the curriculum for an entire degree program in the adaptive system.

In general, **the APLU grant has catalyzed an increased effort to decrease the lecture as the predominant form of teaching.**
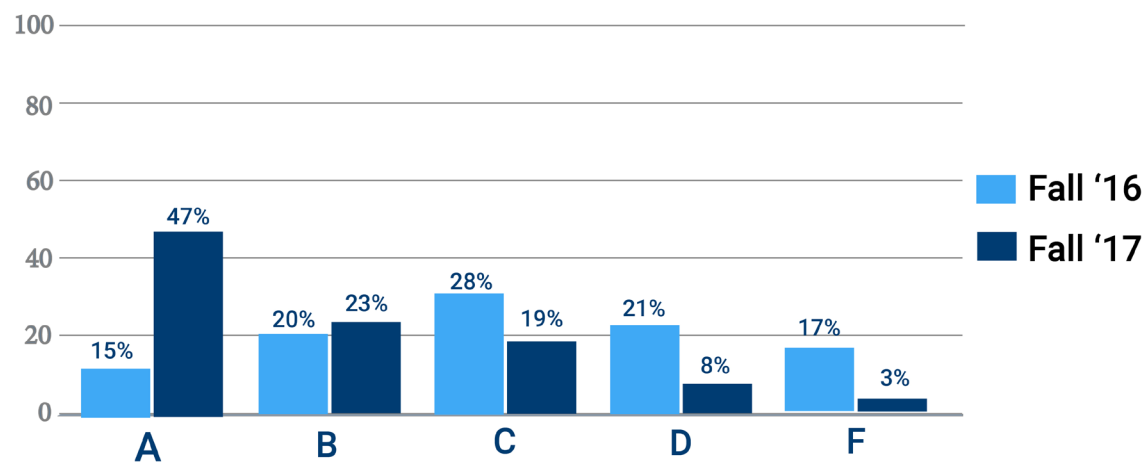
Relevant Findings

College Algebra has shown consistent progress since piloting McGraw-Hill's ALEKS adaptive courseware in 2016. Algebra courses reached high levels of success, showing an overall 17% point gain since 2015 in student success rates to date. In 2012, 57% of students in College Algebra courses without an adaptive learning system in place earned a C grade or better. In 2019, with an adaptive learning system in place, 85% of students in College Algebra earned a C grade or better in 2019.

Student success rate of College Algebra

Fall '16 course redesign implemented

+17%

College Algebra fall semester, on-campus student success rate (grade of C or better) improved significantly over the past three years using the ALEKS adaptive courseware.

The adaptive approach has helped microeconomics students do significantly better on their first midterm exams. For example, 47% of microeconomics students received a grade of A on these exams in 2017 compared to 15% in 2016. D grades dropped from 21% in 2016 to 3% in 2017, and E grades dropped from 17% in 2016 to 3% in 2017. In terms of final grades, as of December 2019, 85% of the students had a grade of a C or higher compared to 73% previously; and 65% mastered the course materials with a B or higher compared to 45% previously.
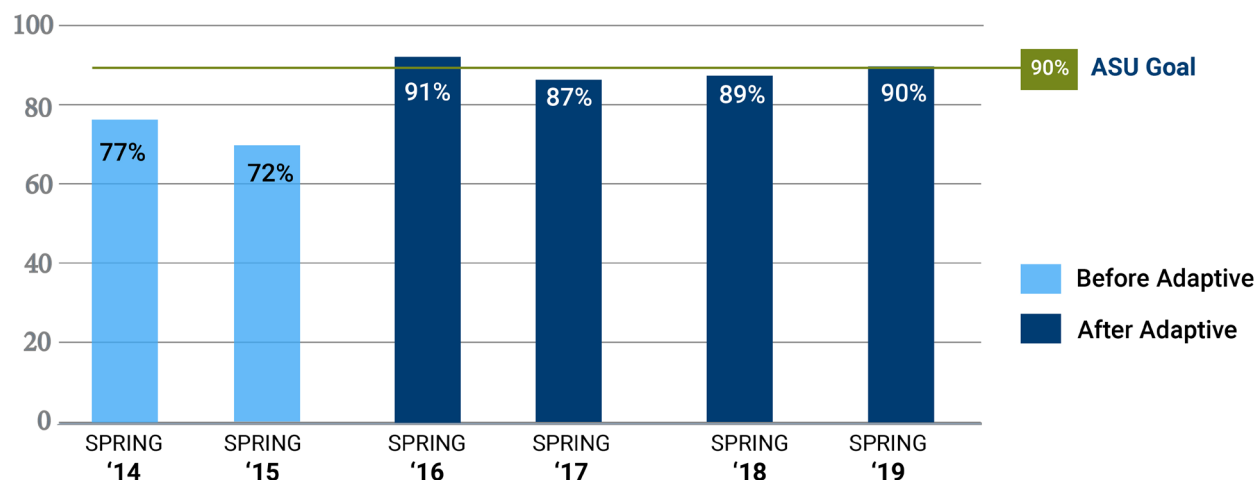
Grade distribution for first midterm exam

The adaptive + active approach helped Microeconomics students do significantly better on their first exam.

Introduction to Biology adaptive courses have also shown significant gains in student success since 2016. In Spring 2015, for instance, 72% of biology students earned a C or better. That percentage increased to 91% in Spring 2016, 87% in Spring 2017, 89% in Spring 2018, and 90% in Spring 2019.

Introduction to Biology*
student performance (C or better)

* With same instructor, same curriculum, and same assessments

The adaptive + active approach in Introduction to Biology has helped the instructor achieve and sustain significant gains in student success over the past four years.

On the opposite end of the success spectrum, the two U.S. history courses have failed to gain widespread adoption in the department. The physics course has also not realized any significant success. The lack of success in these three courses can be attributed to a variety of implementation and training issues, along with departmental situations that were less than ideal.

For instance, although lead faculty in history courses using the adaptive active approach have achieved increased student success rates, momentum was lost as different instructors, untrained in the method of teaching, rotated through the courses.

In physics, the courseware and content in the existing courseware has become dated, Rather than rede-signing the existing course, ASU has aspirations to revolutionize the course by integrating it with Calculus, as in the BioSpine, and then integrating both courses with the lower division engineering courses.

ASU found that accurate data on previous failure rates provided them with motivation to move forward, but like any large-scale adoption of educational technology and change in pedagogic practice, ASU learned that **provosts, deans, department chairs, and faculty members must all work together in agreement to bring about student success**. Doubts and resistance at any of those levels must be avoided — a seemingly impossible task, but surely doable.

In addition, ASU came to understand that **faculty who make such significant course changes need time to learn the new technology and pedagogy.** All key stakeholders learned how to hold back any judging of results until a faculty member has used the system in at least three sections of a course. If faculty members are not supported throughout this threefold process, or if they are judged harshly on their first attempt, they will not continue to take the same risk a second time.

Five Key Findings

Overall, success can be accomplished by honoring five basic rules of the road:

- **Define clear and measurable goals for your program.**

- **Gather data on the current situation to make a strong case for change.**

- **Build a leadership team for the program that includes representatives from all academic levels.**

- **Invest in faculty development so they can use the adaptive + active approach effectively.**

- **Start small and seek an early success so you can build confidence in the process.**

Following these rules has enabled ASU to maintain the APLU grant program's sustainability and expansion efforts.

Future Directions

Looking toward the future, key adaptive courseware stakeholders continue to: identify additional resources to grow the program, reach students in more courses that have high Drop-Fail-Withdraw (DFW) rates, keep upgrading the system, and train an increasing number of instructors on the pedagogy.