Mc Graw Hill Education

ALEKS[®] Case Study Emory University | Atlanta, GA

Case Study Courses:

- Emory College Chemistry Preparation (ECCP)
 Summer Program
- Structure and Properties Semester Course (General Chemistry I)
- Principles of Reactivity Semester Course (General Chemistry II)

Implementation:

- ECCP: remediation/preparatory program offered during the summer
- Semester courses: blended/hybrid and traditional, lecture-based

Course Setup:

- ECCP: ALEKS General Chemistry (1st Semester) with Burdge/Overby Chemistry: Atoms First
- Semester courses: ALEKS General Chemistry (1st and 2nd Semesters) with Burdge/Overby Chemistry: Atoms First, 2e and Carey/ Giuliano Organic Chemistry, 9e

Average Enrollment: Approx. 600 students total

Introduction

When Emory University adopted ALEKS for chemistry six years ago, it was looking to solve two problems. First, the school needed an effective preparation tool to help students be ready for classes on the first day, and also replace an in-house placement test. The second was the need for a learning tool for students to use throughout the semester. Emory had used online homework systems such as ARIS, but wanted something more adaptive in nature.

ALEKS Experience

Overall, Emory's chemistry department has had a very positive experience with ALEKS. The faculty finds the adaptive nature of the program to benefit students, especially since they are coming into chemistry with a wide variety of backgrounds, and the technical support to be excellent.

Dr. Douglas Mulford, Senior Lecturer and Director of Undergraduate Studies in the department, observed that "ALEKS helps to level the playing field amongst all the students. It has raised the level of the course by allowing struggling students to get the extra practice they need while not generating busy work for students who have already mastered those topics. Overall we are very happy with the learning experience provided to students."

Implementation

Emory College Chemistry Preparation (ECCP)

Incoming students learn about the ECCP program through their precollege information program that is administered on campus. Students already in upper division courses are notified through email. Completion of the ECCP program is due at the end of the first week of students' fall semester class, and then they are given a code to move into the ALEKS course experience for their fall semester class. For students who complete the ECCP, their score in the program is worth 3% of their fall semester course grade.

Semester Courses

Professor Mulford uses a flipped classroom, "just-in-time" implementation of ALEKS. This entails having ALEKS Objectives due before each lecture, which is twice a week. The ALEKS Objective assignments have between three and five topics that cover the material to be discussed that day in class. Other faculty use the flipped classroom approach as well. For those who use the traditional, lecture-based approach, the ALEKS Objectives are due on a weekly basis instead of daily, but they do include material that will be covered that week in class.

The ALEKS Objectives and the final ALEKS Knowledge Check are each worth 4% of the course grade. In the spring, the ALEKS Objectives and final Knowledge Check are worth 5% each. The final exam is a paper-and-pencil test with mixed multiple-choice and free-response questions. Each professor writes his or her own final exam. Over the last few years, the faculty have begun to compare common questions across the sections.

Student performance in the course is tracked using a custom ALEKS report and the ALEKS Gradebook. The ALEKS Time and Topic Report and Progress Report are also used to track the individual needs of students throughout the semester. Some faculty use the ALEKS Pie Report to see where the class is for each week, and to provide support where students might be struggling. Occassionally, the faculty will bring the Pie Report to class to show students that even though material they have mastered won't be covered in class, it is still required.

Results Achieved

Emory College Chemistry Preparation (ECCP)

Student feedback on the ECCP is very strong. Regardless of when a student took chemistry in high school, ALEKS helps get students ready for day one and they seem to really appreciate that. The chemistry faculty were initially worried about the workload over the summer (average time to complete is ~17 hours) but students indicate that the program lowers their anxiety. As no student has scored a 100% in the ECCP program, everyone benefits from it since everyone needs to review. In fact, the average ALEKS Initial Knowledge Check score for the ECCP is in the 30th percentile. With most students taking chemistry in their sophomore year, ALEKS is a huge help.



Institution Profile

Founded in 1836, Emory University is a top-ranked private institution recognized for its outstanding liberal arts colleges, graduate and professional schools, and having one of the world's leading healthcare systems. It is located in Atlanta, Goergia and home to over 15,000 graduate and undergraduate students.

Emory scholars and experts generate millions of dollars in research every year, and at the same time maintain a traditional emphasis on teaching.

Results Achieved (Cont.)

Semester Courses

After implementing ALEKS, it was noted how much the program was helping students. This resulted in faculty being able to increase the difficulty and level of the courses, even if it meant no change in the D/F/W rate (an average of 18%). The faculty believes that ALEKS is doing a fantastic job of teaching students the foundational topics. They have seen a fundamental shift in office hours where even the students in the bottom quartile are asking conceptual and integrative problems. ALEKS has helped these students move from being stuck on the Bloom's Taxonomy levels 1 and 2 questions, to being able to tackle the integration and translation-type questions. Since implementing ALEKS, there have been a number of Bloom's levels 3 and 4 questions added to the program as well.

Mulford credits ALEKS for his students' success: "ALEKS has allowed all students to learn and practice the foundational topics so that class time can be more devoted to integration of concepts and deeper explanations that build on the foundational material. The mastery aspect of ALEKS is key to this learning as it meets students where they are and tailors their learning experience to their own needs."

The faculty at Emory has also seen a shift in how class time is spent. Instructors no longer feel the need to cover foundational material, and instead can cover more interesting and in-depth topics in class. Additionally, they place more emphasis on problem-solving methodology, critical thinking, real-world applications, and more levels 3 and 4 in Bloom's Taxonomy.

Topics No Longer Covered in Class

- Nomenclature
- Basic mole calculations
- Balancing equations
- Periodic trends (trends only, not the reasoning)
- Electron configurations
- Basic unit conversions

Additions/Changes to Class Time

- More emphasis on problem-solving methodology
- More critical thinking: "what does this mean?"
- Clearing up misconceptions
- More "chemistry in the read world" discussions
- More Bloom's Taxonomy levels 3 and 4
- "Commercial Breaks": chemistry in the news, careers, adivsing, periodic videos, random chemistry facts, DHMO.org

Instructor Profile

Dr. Douglas Mulford is a Senior Lecturer and Director of Undergraduate Studies in the Chemistry Department at Emory University. He has been teaching at the college level for 15 years and uses his degree in Chemical Education to help design new and innovative teaching strategies.

Dr. Mulford's work emphasizes the role of misconceptions about science and how they influence student learning. In addition, he works with outreach programs to bring chemistry demonstrations and learning to local schools and public venues. Dr. Mulford has a passion for sharing his knowledge of science and helping to inspire the next generation of scientists and citizens.



Student Reactions

The topics-learned-per-hour statistic has been very useful in helping advise students. Students can get a real snapshot of their own learning that is empirically-based, and it helps them to make informed decisions on how many science classes to take at once.

Overall, the student experience with ALEKS is positive, even though they will sometimes complain because it makes them work and doesn't allow them procrastinate. **Figure 1** shows students' feedback in a semester where there were three different implementations of ALEKS by different professors: (1) ALEKS is due "just-in-time" before the material is covered in each class, (2) ALEKS is due once a week before material is covered in class, and (3) ALEKS is due once a week after material is covered in a traditional lecture class.



Student responses to the survey question "How helpful was ALEKS?" (Spring 2016)

"ALEKS is successful at teaching and drilling the fundamental concepts, so students can be active learners in the classroom and feel ready to ask questions about more complex topics."

- Professor Douglas Mulford



Student Comments

"I definitely feel that ALEKS helped me to prepare for class and answer in-class handouts. I liked that I was able to learn about a topic the night before and then come into class and build upon on that knowledge."

"ALEKS is like your older sibling who's there to help but is really annoying at the same time."

"Best thing ever made for a procrastinator because you are "forced" to keep up with lecture and learning."

"YES!! It prepared me for class so well. It let me practice a lot of the basic math and concepts before class, so I came to class understanding the material."