

Getting FIU Students Chemistry Ready

INSTITUTIONAL CONTEXT

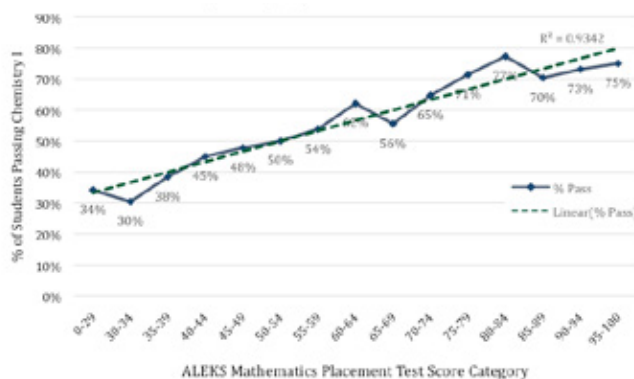
In 2009, Florida International University (FIU) began a coordinated effort to improve student success by addressing student completion of introductory courses required to progress to more advanced work. Two years later, FIU launched its Graduation Success Initiative (GSI), a university-wide set of interventions involving academic advising, academic pathways, and teaching and learning.

This case study focuses on GSI's reforms around FIU's General Chemistry, a gateway course for students entering many of the science, technology, engineering, and math (STEM) majors, which required no prerequisites and which many students took during their already taxing first year. In 2012–13, General Chemistry I (Chem I) enrolled 2,021 students and had a 36 percent DFWI rate—that is, 36 percent of students dropped, failed, withdrew from, or earned a grade of “incomplete” in the class. A cross-institutional team dove deeper into the data to find a solution to this alarming challenge and to implement efforts to enhance student engagement in the chemistry classroom, resulting in significant improvements in student performance.

USING DATA TO IMPROVE STUDENT OUTCOMES

With over a third of Chem I student experiences resulting in a DFWI, FIU academic leadership understood the necessity of an intervention. The notion of requiring students to complete a chemistry placement exam had been circulating for years, but the lack of consensus on a placement instru-

Figure 1. Percentage of 2012 FTIC Cohort students Passing Chem I by ALEKS Math Placement Test Score.



ment and the logistics of administering a placement exam presented formidable obstacles. After a visit to Arizona State University to learn more about its student success initiatives, however, the director of the Academic Advising Center convened key university stakeholders and recommended that historical student-level data be examined to identify factors correlated with success in Chem I.

Partnering with the Department of Chemistry and the College of Arts & Sciences' enrollment management team, the Office of Retention & Graduation Success examined the data and determined that the ALEKS Mathematics Placement Test, which incoming FIU first-year students are required to take, was a good predictor of performance in Chem I. As illustrated in Figure 1, Students who qualified to take precalculus algebra with an ALEKS score of 65 or higher had over a 60 percent chance of succeeding in chemistry,

while students with ALEKS scores of 30–49 had less than a 50 percent probability of passing Chem I.

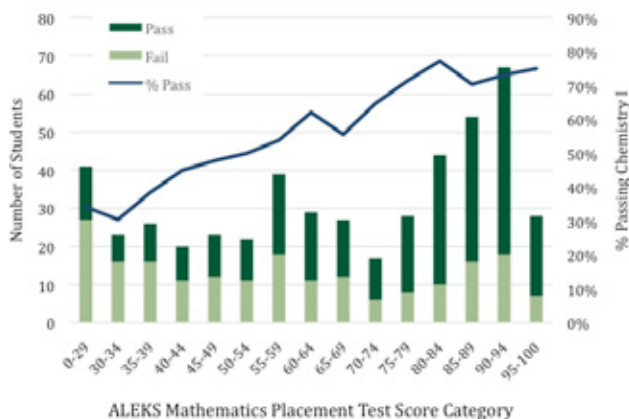
Based on this analysis, FIU determined that College Algebra should be instituted as a prerequisite for Chem I. A two-credit hour Fundamentals of Chemistry course was also repurposed, so students who scored below a 50 on the math placement test could attain more of the scientific and computational skills they would need in Chem I.

RESULTS

Overall, the Graduation Success Initiative helped raise on-time graduation by 16 percentage points in the last 4 years. In five gateway courses, DFWI rates decreased an average of 7.7 percent from fall 2012 to fall 2015—from 28.3 percent to 20.5 percent for first-time, first-year students. Improvement was greatest in the courses that had the highest failure rates in 2012: College Algebra and Chem I. There was an increase of 11.7 percent in Chem I completion during this time frame. Figure 2 provides a graphic depiction of how the passing rates have improved significantly since the new placement criteria were instituted. The fact that Chem I passing rates across all levels of ALEKS placement scores have improved supports the fact that the pedagogical and curricular changes have had a positive impact on all students' success in Chem I.

A follow-up study examined the outcomes of students who took Fundamentals of Chemistry in the fall and then Chem I in the spring as compared to the outcomes of students who did not take the Fundamentals course in the fall. The results indicated that students who took Fundamentals first showed good to better-than-average performance in

Figure 2. Performance in Chem I by Math Placement Test Score for 2012 FTICs: Number of Passing and Failing, Percent Passing



Chem I, despite initially lower placement scores. Furthermore, 74.5 percent of students who took Fundamentals of Chemistry passed Chem I, compared with 65.7 percent of students who did not take Fundamentals. At FIU's Biscayne Bay Campus, students are self-selecting to take the Fundamentals course, and of those who take it and pass, 100 percent pass Chem I.

Students' improvement in Chem I performance therefore enhanced their odds of persisting to their second year and graduating on time—alleviating the anxiety and financial repercussions of delayed degree completion, potentially solidifying their interest in a STEM field, and likely resulting in a deeper understanding of chemistry that will prove important in later studies and the workplace.

LESSONS LEARNED

During the GSI process, FIU learned useful lessons and encountered areas for growth that may be helpful to other campuses using data to bolster student success.

- ▶ **Using student-level data allows for focused and targeted interventions with high odds of success.** For the sake of students, institutions should use all available historical data and examine it closely when determining how to support student learning and degree completion.
- ▶ **Access to national student-level data could help to identify additional correlations among variables related to student success that could lead to additional placement and policy interventions.** While sharp attention to data security and student privacy is necessary, collecting, examining, and disseminating data and analyses can serve as an extremely effective mechanism for motivating change. Thus, contributing to a national database that will mask the student's identity but include certain demographic and historical characteristics could be an alternative.
- ▶ **Modeling the use of data to inform decisions can be contagious.** The FIU Chemistry team has begun measuring student performance via a concept inventory and an attitude survey and is currently examining the results to determine the most appropriate curricular and pedagogical next steps.