# Student Trajectories in a College Algebra With Support Course Using Standards-Based Grading

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We share how the implementation of a College Algebra with Support (CAWS) course affected student success in mathematics and subsequent course taking behavior. The CAWS course added one additional credit hour to the existing College Algebra course and includes student supports such as just-in-time reviews and study skills. The course uses student-centered pedagogies (Abell et al., 2018; Bressoud et al, 2015; Deslauriers et al., 2019; Freeman et al, 2014; Theobald et al., 2020) and standards-based grading (Nilson & Stanny, 2015; Zimmerman, 2020). CAWS was first implemented in Fall 2023, with an enrollment of 610 students. In Spring 2024, 507 students enrolled in CAWS. As part of the standards-based grading structure, a significant portion of a student's grade was earned by completing learning checks (quizzes) on individual learning objectives (LOs). Students were expected to demonstrate skill twice on each LO. We sought to examine the question: *What are common student trajectories in a CAWS course that uses standards-based grading?*

Institutional data were collected from the university Systems Intelligence and Data Analytics Office. Course level data on when LOs were met during the semester were gathered from course coordinators. Although five years of data were collected, the analysis presented here focuses on Fall 2023 and Spring 2024. Data included: demographics, mathematics course enrollments, final course grades, and learning objective data from CAWS in Fall 2023 and Spring 2024.

To analyze the data, we first looked broadly at how final course grades were distributed based on student demographic data. We then conducted hierarchical clustering analysis on the Fall 2023 data based on the week when students successfully completed each LO for the first and second time. Students were grouped into six clusters by the similarity of their performance on LOs. Group 1 has 272 students (44.6%) who demonstrated consistent strong learning performance and mostly received A's. Group 2 contains 61 students (10%) who started late in LO#1 but caught up since LO#2 and consistently met most of the LOs twice. Most of them received A or B's. Group 3 has 66 students (10.8%) who had a slow start and most LOs were met after week 9. Most students in this group received B or C's. Group 4 has 34 students (5.6%) who started strong in the first three LOs but then struggled to complete later LOs. Group 5 with 99 students (16.2%) mostly started after week 7 and were inconsistent with completing LOs. Group 6 has 78 students (12.8%) who did not complete almost all the LOs. Groups 4 and 5 have high DFW rates at around 80%, while students in Group 6 have 100% DFW rate.

In addition to studying CAWS, we started examining student success in future courses. There has been a significant increase in the number of students taking Trigonometry as a result of the implementation of CAWS, particularly by students of color. This suggests that these students are persisting on STEM degree paths that require them to take calculus. Our goal is to use our analyses to improve CAWS and better support students as they continue to take mathematics courses. Future work will continue to analyze student trajectories in courses such as Trigonometry and Calculus I.

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