PREPARING STUDENTS FOR CALCULUS

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ABSTRACT

As a participant in CSU Northridge's Consortium, CSULB has implemented the Hybrid Model in Business Calculus and a modified version of the Hybrid Model in Precalculus Algebra for several years. In both classes, we implement ALEKS, on-line and off-line homework, partially completed lecture notes and common exams. The infrastructure for this pedagogy is in place; we turn our attention to the content in these courses. In Precalculus Algebra, we work to determine how to best prepare students for success in Calculus, and how to recognize when we have done so. Our attention turned to intermediate algebra content, when a team of CSULB professors, supported by the Chancellor's Office to redesign calculus, used knowledge of intermediate algebra as a measure for preparedness for calculus, and found a large percentage of students unprepared. We plan to extend our efforts to address intermediate algebra content, beyond our use of ALEKS. We will also include content from intermediate algebra more directly on our homework and exams, to help students transfer ALEKS content out of ALEKS for use in the rest of the course and beyond. In working toward a systematic method to determine how well Precalculus Algebra prepares students for calculus, we attempt to align the grading among the faculty teaching large sections of Precalculus Algebra. We analyze credit awarded on each problem on the common midterms and finals in Fall 2013 (nearly 1000 students) to detect problems on which the statistics are significantly different from section to section. For these troublesome exercises, we engage faculty in designing common rubrics, or consider other ways of assessing that content.

MOTIVATING PROBLEMS

The algebra content on which calculus students struggle lies in the realm of intermediate algebra, well below the algebraic study of functions students currently experience in Precalculus Algebra. From a comparison of grades received in Precalculus Algebra and Calculus I, it appears that students can perform successfully on our assessments, while remaining deficient in intermediate algebra. While we increased the numbers of students completing the individual remediation task in ALEKS (by adjusting the numbers of topics within each ALEKS Objective), we have no evidence that content learned in ALEKS transfers for use in other parts of the course and beyond.

The grades awarded in the five 200- to 270-student sections of Precalculus Algebra in Fall 2013 varied dramatically in pass rates (ABC over census enrollment) as well as A-rates, despite the use of common materials and assessments. While the professors teaching these sections work together toward assessing common goals, so far, the grades in the course have not consistent.
TECHNOLOGY ACTIVITIES AND CURRICULUM

Our current redesign includes 1) systematically including intermediate algebra content (reflecting topics in ALEKS and elsewhere in the curriculum) on midterm exams, 2) developing homework assignments in our other on-line system covering intermediate content, and 3) analyzing Fall 2013 problem-by-problem data from midterm exams to determine a cause for the inconsistent grades awarded.

TIMELINE

We made initial changes to our objectives for Exam 1 to include appropriate intermediate algebra content, and plan to continue this practice on the other midterm exams and the final. We are considering including two WebAssign on-line homework sets to reinforce the content we plan to assess.

We are currently in the process of entering data from Fall 2013 into a spreadsheet for analysis mid-Spring 2014.

OUTCOMES

As we improve students knowledge of intermediate algebra and make the grades awarded more explicit, we expect to see the grades from Precalculus Algebra become better predictors of success in calculus. As such we expect to improve pass rates in calculus for students who complete Precalculus Algebra at CSULB.

BROADER IMPACTS

Precalculus Algebra is a prerequisite for Calculus (for engineers and physical scientists), Survey of Calculus (for biology and health professionals), General Physics, and General Chemistry, all courses taken in the early stages of degrees in Natural Sciences, Engineering, and Health Sciences. Improving the degree to which Precalculus Algebra prepares students for these courses leads to more student-success in early coursework, and retention in the STEM majors.

REFERENCES

CSU Northridge Consortium ePortfolio –link?