An Internet-Based Homework System to Improve Student Performance in Precalculus

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Target Course: Precalculus (MTH195)

Intervention: internet-based homework

Abstract:
The principal research question addressed by this project was whether a well-designed system of internet-based homework and content resources would improve overall student performance, compared to the pencil-and-paper approach currently used in CCNY's precalculus course. We developed a database of homework assignments using Maple TA, a web-based testing and assessment system. Students received feedback on all homework, which included Flash-based graphics questions not usually assessed through on-line homework. The database consisted of more than 500 questions, with randomized inputs, paralleling those selected from the Mathematics Department’s current precalculus text. In both fall 2010 and spring 2011, the entire day session cohort of the course was randomly assigned into experimental classes using Maple TA and control sections following traditional homework methodology. Both groups followed the same homework, with the problem parameters randomized for the Maple TA cohort. The principal measure of comparison was the final exam, which was the same for all students and was group graded by all instructors. Outcomes were analyzed adjusting for baseline student math preparation, such as scores on the Compass math placement exams, Math SAT scores, and New York State Math Regents. The hypothesis that online homework would improve performance was not supported. In both semesters there was no significant mean difference between the groups on final exam grades. Nor was there a significant mean difference between the groups in course grades. Because of its more objective nature, findings bearing on the final exam were deemed more important than the findings bearing on course grades. For the Maple TA cohort, we were able to show that the homework completion rate was significantly correlated to performance on the final exam, controlling for precourse mathematics knowledge. Because parallel data on homework performance in the control classes was not available, we could not compare the relation of homework performance to final exam performance in the two groups.