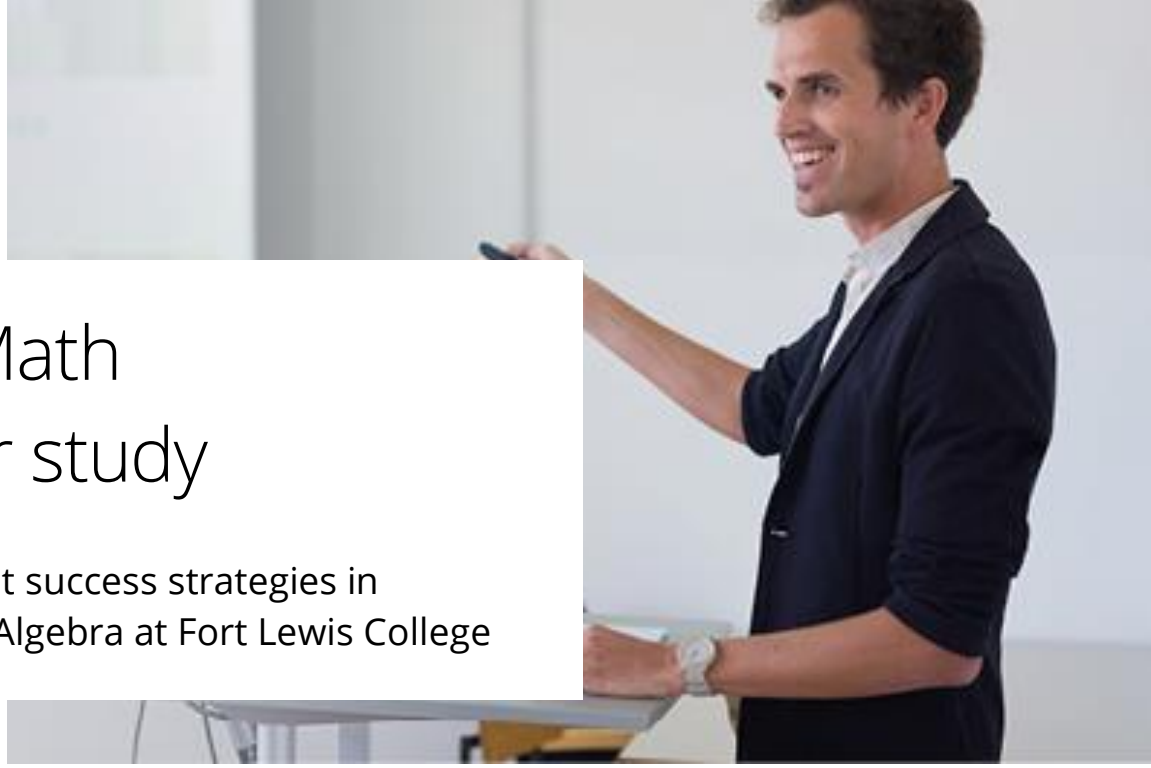

MyLab Math educator study

A look at student success strategies in Introduction to Algebra at Fort Lewis College

Key findings:

- Student persistence in Introduction to Algebra was statistically significantly higher when attendance at the campus tutoring center or increased MyLab Math usage were required.
- Student level of completion of MyLab Math online homework was significantly correlated with their final course grade.
- Student performance in the subsequent developmental math course, Intermediate Algebra, was statistically significantly better when usage of MyLab Math was increased in the introductory course.

School name: Fort Lewis College, Durango, CO

Course name: Introduction to Algebra

Course format: Face-to-face

Course materials: MyLab Math access code; *Introductory and Intermediate Algebra through Applications* by Akst and Bragg

Timeframe: Fall 2013

Submitted by: Leslie Goldstein; Senior Lecturer, Freshman Math Program Sandra Gilpin; Assistant Dean, Arts & Sciences; Senior Lecturer, Freshman Math Program, Brian Burke; Professor, Psychology

Setting

A public, four-year liberal arts college overlooking the Animas River Valley and historic downtown Durango, Fort Lewis College serves approximately 3,800 students hailing from all 50 states, 155 American Indian tribes and Native Alaskan villages, and 17 countries. Approximately 25 percent of the student population is Native American. The average class size is 23 with a student-faculty ratio of 19:1. Mid-range ACT scores are 19–24 and mid-range SAT scores for math are 465–565. The most popular majors include Art & Design, Biology, Business Administration, Engineering, English, Environmental Studies, Exercise Science, Psychology, Sociology, and Teacher Education.

About the course

Introduction to Algebra, offered in the Freshman Mathematics Program, provides review and instruction in college preparatory mathematics for students with deficiencies or apprehensions concerning required entrance-level mathematics courses. Students with ACT Mathematics scores of 17–18 are placed into Intermediate Algebra, whereas students with scores below 17 must first take Introduction to Algebra. The instructor uses a combination of lecture, problem-solving skills, and individualized assistance. Students are substantially involved in the instructional process through class participation, problem solving, completing homework, in-class activities, and group work. Student work includes writing, as well as doing calculations. Throughout the course, topics such as number systems, algebraic expressions, algebraic properties, and algebraic manipulations are learned to solve and graph linear equations. Applications are included. Classes meet three times per week for 55 minutes each as a standard lecture course. Credit for the class does not count toward graduation or GPA.

Challenges and Goals

After many years as a developmental mathematics educator, Goldstein wanted to address what she believed to be a key obstacle to student success: students repeatedly not doing enough work outside of class to hone their mathematical skills. She and her colleagues hypothesized that two interventions—increasing tutoring center use and online math homework completion—would improve student performance and success in the Introduction to Algebra course. They designed an independent study to research whether students in this first developmental mathematics course who spent more time working in a supportive tutoring center where live tutors or instructors could answer their questions or students who spent more time working online on their own using MyLab Math to provide immediate feedback would outperform students in the standard lecture course with no additional mandated support.

Implementation

Three sections of the course were offered in Fall 2013, each taught by Goldstein. All three required the textbook, MyLab Math code for homework and end-of-week quizzes, and a scientific calculator. No instructional changes were made to the control group. The 32 students in this section were expected to complete twenty assignments and seven end-of-week quizzes in MyLab Math, and four written tests including a final exam.

Students in the second section of the course completed all of the assignments, quizzes, and tests as in the control section, but the twenty MyLab Math assignments contained nearly double the number of exercises with the expectation that this group would then spend two hours per week on online homework instead of one hour weekly. This section of the course enrolled 35 students and was referred to as the online or MyLab Math group.

The 30 students in the third section of the course, the tutoring group, also completed all of the assignments, quizzes, and tests as in the control section, but were additionally required to attend the Algebra Alcove a minimum of two hours per week. This target was chosen because it was more than double the number of hours that students in previous semesters of Introduction to Algebra spent in the tutoring center each week.

The Algebra Alcove is a free tutoring center that helps students in their developmental math classes by developing their confidence and skill sets. Students enrolled in any freshman math class may work with tutors just by showing up during posted hours. It is staffed by Freshman Math Program instructors and peer tutors having various levels of College Reading & Learning Association (CRLA) certification.

Students are placed into the Introduction to Algebra course by SAT or ACT score. Those wishing to challenge their placement may do so by taking the Accuplacer exam in the first week. For this study, students were not aware of the different treatments at the time of enrollment. Students in all three sections of the course had unlimited access to the Algebra Alcove and could certainly utilize MyLab Math more heavily by doing additional exercises on their own.

Results and Data

The effects of the treatments on student persistence were statistically significant ($\chi 2$ [1, N=97]=5.09, d=0.47, p=0.03] for both treatment groups compared to the control group, measured as the percentage of students who left the class and did not take the final exam. The walk-away rates were 31 percent for the control group (10/32), but just 10 percent (3/30) and 14 percent (5/35) for the tutoring and MyLab Math groups, respectively.

Assessments

Three different indicators of student performance were examined to assess the full impact of these distinct Introduction to Algebra sections:

- the extent to which students persisted in the course by comparing retention percentage and non-completers by section
- student performance in the course by comparing specific and total grade components by section and by examining correlations of actual online homework and tutoring usage with final course grades
- long-term effects of each intervention by comparing these students' performances in their next semester's Intermediate Algebra course

Usage rates for the Algebra Alcove tutoring center varied by section, as expected. The tutoring group spent a mean of 18.27 hours (SD=13.57) there during the 14-week semester compared to 5.07 hours (SD=8.34) for the online group and 8.70 hours (SD=17.36) for the control group. Results revealed a statistical significance between the tutoring group and the two other groups t(94)=3.92, d=0.85, p<0.001. In a comparison of time spent in MyLab Math, Goldstein discovered that even though the online group completed roughly double the number of homework problems in MyLab Math each week compared to the other two groups, the time spent doing the online homework did not vary much by section. The online group spent a mean total of 12.68 hours (SD=5.37) on MyLab Math problems during the 14-week semester, compared to 11.21 hours (SD=7.00) for the tutoring group and 10.65 hours

(*SD*=6.21) for the control group. Results were not statistically significant, $t(94)=0.81$, $d=0.16$, $p=0.47$. Average time spent on each of the twenty homework assignments was about 20 minutes for the online group (with roughly double the number of exercises) compared to 17 minutes or 18 minutes for the other two groups [$t(94)=1.34$, $d=0.28$, $p=0.18$].

When final grades of the treatment groups were compared with those of the control group, the treatment group excelled ($d=0.36$), though the difference was not statistically significant [$t(94)=1.69$, $p=0.09$]. However, students' level of completion of MyLab Math online homework across sections was significantly correlated with their final course grade, $r(97) = 0.92$, $p<0.001$. Students' use of the tutoring center across sections was significantly, but less strongly, correlated with the final course grade, $r(97)=0.32$, $p=0.002$.

It was also shown that the MyLab Math online homework intervention also had "sleeper effects" the following semester in a student's next level math class. Students in the MyLab Math group performed nearly a full letter grade higher in Intermediate Algebra than students from the other two groups.

In addition, the students' level of completion of the online homework in their first algebra class, regardless of which group they were in, was significantly correlated with their final grade in their next algebra class.

The Student Experience

For this study, students were not aware of the different treatments at the time of enrollment. Goldstein received the following comments from students enrolled in course:

> "This course made me aware of some of the resources available to me on campus and online to help me with my math. I learned valuable math skills."
>
> "The program [MyLab Math] itself was a little confusing at first, but once I got it it was easy to use. I loved seeing "Good job!""
>
> "I felt like the online assignments [in MyLab Math] really helped solidify the information we [went] over in class."

Conclusion

Goldstein believes that the study has confirmed her working hypothesis. Students who are required to spend more hours outside of class time—either in the tutoring center or doing online homework—perform better in their classes than students who are left to their own devices. In general, data suggest these students persist longer, get help sooner, and do not fall behind at the same rate. But the specific type of help that students receive may make a substantial difference in the long run. Requiring more students to do more skill practice on their own, with a program such as MyLab Math, yielded a sleeper effect that may work on multiple levels. Not only do students get practice with foundational skills, but they also receive immediate feedback on their mastery of those skills that may boost their self-efficacy. MyLab Math was chosen over other available programs because of its feedback components.

Learn more about Fort Lewis College's exciting study and all of its results here: Boosting Tutoring or Homework in Introduction to Algebra Classes.

Read Leslie Goldstein's blog post, Online homework helps students learn in ways traditional textbooks may not, published December 2016 on Pearson's Teaching & Learning Blog.

Learn more about MyLab Math

Learn more about how MyLab Math could benefit your course by visiting: https://mlm.pearson.com/northamerica/mymathlab/index.html