

MyLab Math educator study examines impact of homework scores on pass rates in College Algebra II at Penn State

Key Findings

- Students earning higher MyLab Math homework scores earned higher final course scores.
- The final course pass rate for students earning 85% or higher on MyLab homework was 52 percentage points higher than for those students who earned less than 85% on MyLab homework.
- The pass rate for the Fall 2017 cohort of College Algebra II was 79%.

Study Specifics

School name: Pennsylvania State University, University Park, PA
Course name: College Algebra II
Course format: Hybrid
Course materials: MyLab Math for *Algebra and Trigonometry, 2nd* by Trigsted

Timeframe: Fall 2017
Educator: Steven Hair, Associate Teaching Professor and Coordinator of First Year Courses
Results reported by: Julie Labbiento, Pearson Customer Outcomes Analytics Manager

Setting

- Locale: a multi-campus, land-grant, public research [university](#)
- Enrollment: approximately 47,000 at [Penn State University Park](#)
- Undergraduate: 87%
- First-time, degree-seeking freshmen: 19%
- Full-time retention rate: 93%
- Ethnicity/race: 34% minority
- Six-year graduation rate: 85%

About the Course

[College Algebra II](#) is a three-credit course that serves primarily as a prerequisite for Calculus and also counts for general education credit. Topics covered include relations, functions, and graphs; polynomial and rational functions and graphs; word problems; nonlinear inequalities; inverse functions; and exponential and logarithmic functions. College Algebra I is a prerequisite. Students are advised that, while graphics calculators are useful as a study and learning tool when used appropriately, they are not essential and no calculators are allowed on quizzes, exams, or on the final exam.

Challenges and Goals

Steven Hair is Associate Teaching Professor and Coordinator of First Year Courses at Penn State. While MyLab™ Math was already in use at Penn State when he began teaching around 2010, he shared several reasons for continuing to use MyLab in his College Algebra II course. As a freshman math course, many sections are staffed by graduate students, and there is a need to ensure consistency across sections; MyLab allows him to achieve this standardization easily. Hair also maintains the importance of MyLab's flexibility, since not all course

assessments are delivered in MyLab. Finally, he appreciates how the content in MyLab aligns with the course textbook, so that students see them as a cohesive pair of study tools.

Implementation

Penn State's College Algebra II course is offered in a hybrid format, combining two days of classroom lecture with one day in a computer lab. All sections are taught on campus; there are no online sections. The course utilizes weekly homework in MyLab as well as quizzes, lab activities, two midterm examinations, and a comprehensive final exam. The course serves around 600 students each semester and sections are often taught by graduate students, so assessments are standardized, not only to ensure consistency in delivery and grading, but also to alleviate the graduate students' stress of creating assignments and exams on their own. Hair uses the [coordinator course](#) feature in MyLab to create identical homework shells for each section of the course.

Homework: Hair is an advocate of using digital homework systems for lower-level courses such as College Algebra II. He finds that questions in courses at this level are generally easy for a computer to grade, usually having little to no partial credit or responses that would require instructor interpretation. Above all, he feels that the instant feedback afforded by using MyLab Math is especially important. "When students are learning at this level, I don't want them to do homework incorrectly [on paper], then turn it in and not find out what they did wrong until the following week," he says.

During the first two class periods of the week, traditional lectures are delivered by the instructors or graduate students, aligning to weekly homework assignments in MyLab. Students have unlimited attempts to earn the maximum number of points on each homework assignment before their due date on Tuesday of the week following the associated lecture. Late homework is only accepted by permission of the instructor. No minimum homework score is required.

Another feature of MyLab that Hair uses for this course is the set of [learning aids](#) available in the homework assignments. He keeps all learning aids turned on in all of the homework assignments, including View an Example and Help Me Solve This, noting, "It is often hard to get students to read the text at this level, and the learning aids help fill this gap. I like that the MyLab homework problems are tied directly to the textbook and that students can click in to the eText right from the problem if they need to. And having the learning aids right there when they're working on a problem makes them look at the examples a little more, as well." When asked on a voluntary survey for their opinions on the learning aids, many students responded favorably, with one saying, "[Help Me Solve This gives me] the opportunity to try a similar problem and receive full credit for the problem, boosting my grade and not negatively impacting it." Another student shared, "The different tools available to you while doing homework were so helpful."

Quizzes and lab activities: During the third class period of the week, students attend class in a computer lab. This lab time is not intended to be spent on homework assignments. Rather, students either take proctored quizzes on the covered material or they work on lab activities that are designed to give them the chance to more deeply explore the algebra covered in the lecture. All quizzes and lab activities are standardized across all sections of the course.

Examinations and final exam: Two 75-minute, 100-point midterm examinations are given during the course of the semester. All students take their midterm exams at the same time on campus. These multiple-choice exams are taken on Scantron® forms and cover the lecture content up to that point. A 150-point comprehensive multiple-choice final exam is also given at the end of the semester. No textbooks, notes, or calculators may be used on any of the exams.

Assessments

- 200 points Examinations (2)
- 150 points Final examination (comprehensive)
- 75 points Quizzes and lab activities
- 75 points MyLab homework

Grades are assigned on the basis of 500 points. No extra credit is available in the course.

Final course grades are assigned as follows:

A (460–500 points) | A- (450–459 points) | B+ (440–449 points) | B (410–439 points) | B- (400–409 points)
 C+ (390–399 points) | C (350–389 points) | D (300–349 points) | F (0–299 points)

Results and Data

Over the years, Hair has tried different approaches to using homework in the course, including allowing only three attempts on each assignment instead of unlimited attempts, and incorporating the MyLab Study Plan as an additional source of required, but ungraded, practice for students. He ultimately determined that adding more assessments seemed to increase the complexity of managing and keeping up with them for both the students and the instructors, without presenting obvious improvements in student outcomes. He decided to adopt the current practice regimen of homework with unlimited attempts before the due date, in hopes of finding balance while providing the necessary rigor to achieve success. To that end, the pass rate for the Fall 2017 cohort of College Algebra II ($n=571$) was 79%, which pleases Hair.

An analysis of MyLab homework scores and final course scores (figure 1) shows a moderately strong correlation between the two assessments ($r=0.58$, $p<0.0001$). It should be noted that homework contributes 15% towards final grades, which may impact this relationship. A correlation measures the strength of a relationship between two variables, where r is the correlation coefficient. The closer a positive r -value is to 1.0, the stronger the correlation. The corresponding p -value measures the statistical significance or strength of the correlation, where a p -value <0.0001 shows the existence of a positive correlation between these two variables. Note that correlation does not imply causation; it is simply a measure of the strength of the relationship.

Correlation between MyLab homework scores and final course scores

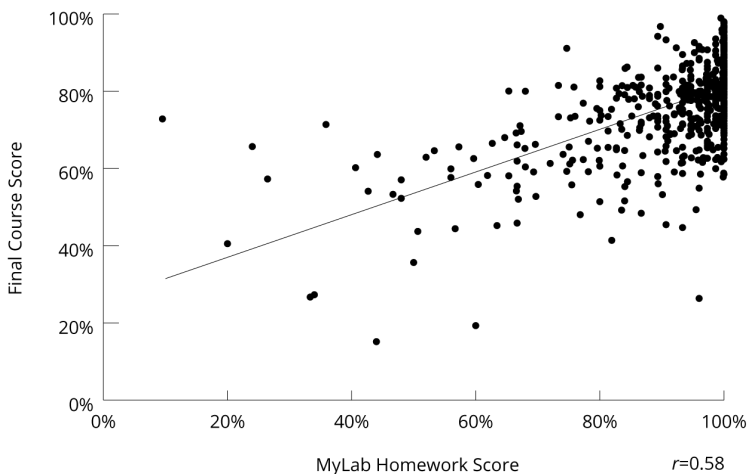


Figure 1. Correlation between MyLab Homework Scores and Final Course Scores ($n=571$)

Further analysis revealed more about the impact of students' homework scores on final course scores. Figure 2 illustrates the pass rates associated with students who earned homework averages falling into five ranges: 90–100%, 80–89%, 70–79%, 60–69%, and 0–59%. The data show that each ten percentage point increase in homework scores is associated with an average 20 percentage point increase in the course pass rate, with the greatest jump between the 70–79% and 80–89% ranges.

Course pass rates by MyLab homework average

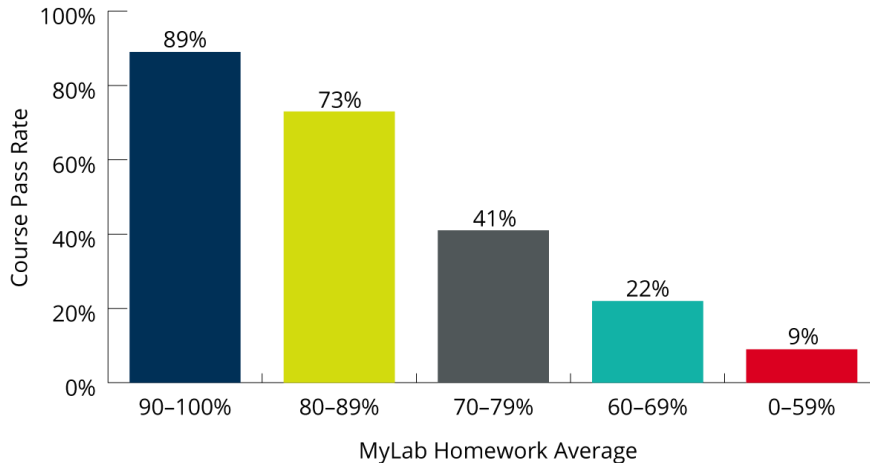


Figure 2. Course Pass Rates by MyLab Homework Average ($n=571$)

A deeper analysis using a t -test assuming equal variances centered on this result. Figure 3 shows the final course pass rate for students earning 85% or higher on MyLab homework ($M=79\%$, $SD=99\%$, $N=470$) was 52 percentage points higher than for those students who earned less than 85% on that assessment ($M=63\%$, $SD=139\%$, $N=101$), $t(569)=13.67$, $p<0.05$.

Impact of MyLab homework on course pass rates

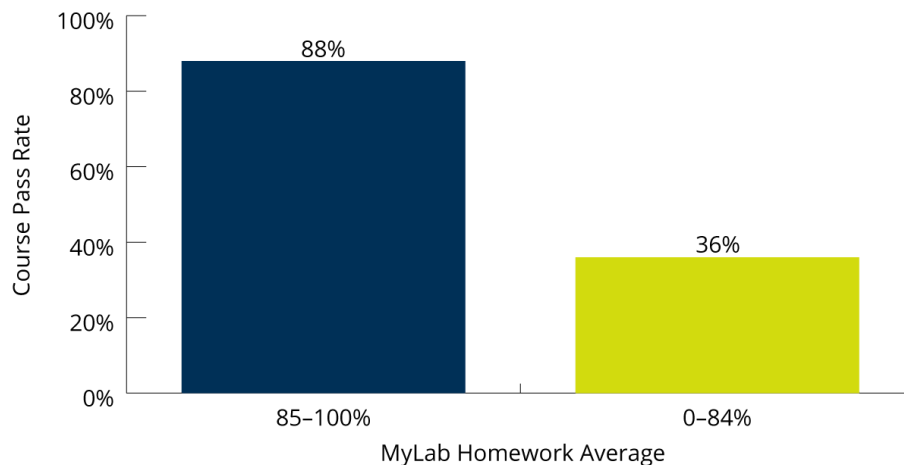


Figure 3. Course Pass Rates Based on MyLab Homework Average of 85–100% ($n=470$) and 0–84% ($n=101$)

The Student Experience

In an anonymous, voluntary survey given to students at the beginning of the Fall 2017 semester (35% response rate), students self-reported the following demographic information:

- 75% of students were in their first semester at Penn State
- 83% of students graduated high school in 2017
- 68% of students were taking the College Algebra II course either because it was required for their major or as a prerequisite for the Calculus course
- 32% of students were taking the course to fulfill a general education requirement

Students were also asked to complete an anonymous, voluntary, end-of-semester survey in Fall 2017 (13% response rate) to share their perspectives on the course and MyLab Math. Below are selected responses:

How has MyLab Math impacted your learning in your course?

- *"MyLab has helped me understand the concepts of problems and has showed me step by step on how to perform a problem and go about the right way of doing it. This helped me tremendously prepare for tests and quizzes especially by the amount of practice problems we were given."*
- *"The repeated exercises and teaching methods online are very helpful to supplement what I do in class."*
- *"The practice problems increase with difficulty as I get better so I'm constantly challenged."*

What do you feel are the benefits of using MyLab Math?

- *"When I could look at other problems and if I still did not understand, I could have help solving the problem so next time around I can do it by myself."*
- *"Definitely the tools/options to help you through a problem and show you the steps."*
- *"It's very accessible. I loved being able to do my homework at any point, anywhere."*

Conclusion

In teaching and coordinating a large freshman-level course taught largely by graduate students, Steve Hair uses MyLab Math to keep the content and homework assignments standardized and to provide the students with instant feedback and additional resources, such as links to the eText and learning aids on each exercise. Results show that students who performed better on homework earned higher final grades. Hair says, "MyLab has been the best [digital homework program] I've been able to find in terms of flexibility to do what I want it to do."