

# MyLab Math educator study explores impact of test retake program in College Algebra course at Louisiana State University

<p><b>School name</b> Louisiana State University, Baton Rouge, LA</p> <p><b>Course name</b> College Algebra</p> <p><b>Course format</b> Hybrid: open lab, fixed due dates</p> <p><b>Course materials</b> MyLab Math with <i>Algebra &amp; Trigonometry</i> by Trigsted</p>	<p><b>Timeframe</b> Fall 2006–Fall 2017</p> <p><b>Educator</b> Phoebe Rouse, Director, Precalculus Mathematics Debra Kopcso, Coordinator, College Algebra Stephanie Kurtz, Data Manager, LSU Math Lab, and Coordinator, Trigonometry</p> <p><b>Results reported by</b> Traci Simons, Pearson Customer Outcomes Analytics Manager</p>
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## Key Findings

- Students who earned a D/F on Test 1 and participated in the school’s Test Retake Program, which requires several steps of remediation, saw an average course success (ABC) rate of 72 percent, compared to a course success rate of 41 percent for students who also earned a D/F on Test 1 but did not participate in the program.
- Data show that Test 1 D/F students who participated in the Test Retake Program had an average Test 1 increase of 22 points.
- Instructors maintain that combining several of MyLab Math’s features, such as Personalized Homework, Prerequisites, Question Pooling, and Item Analysis, was key in automating the Test Retake Program.

## Setting

Ranked 65 among Kiplinger’s Top 100 Public Colleges, Louisiana State University (LSU) is the highest-rated public university in Louisiana. According to its website, LSU has proven to be a place where students can get an exceptional education with a great return on investment — in fact, two out of three students graduate with zero debt, and 92 percent of all students receive scholarships or financial aid.

The school’s [2017 University Fall Facts](#) report states the following demographic information:

- Total enrollment: 30,863 (82 percent undergraduate)
- Gender: 53 percent female, 47 percent male
- Ethnicity: 69 percent Caucasian, 12 percent African American, 6 percent Hispanic/Latino, 5 percent non-resident alien, 4 percent Asian, 4 percent either American Indian/Alaskan Native, Native Hawaiian/Other Pacific Islander, two or more races, or unknown.
- Full-time enrollment: 85 percent
- Residence: 77 percent Louisiana, 18 percent other state, 5 percent other country
- ACT composite: Mean = 25.6, 25th percentile = 23, 75th percentile = 28
- Retention rate: 82.9 percent returning in Fall 2017 that were enrolled in Fall 2016
- Graduation rate for 2011 cohort: four year = 40.4 percent, five year = 61.8 percent, six year = 66.6 percent

## About the Course

To be eligible for the [College Algebra course](#) at LSU, students must have a minimum Math ACT score of 19. First-semester freshmen with a Math ACT score of 25 or greater receive automatic credit for College Algebra as long as the Math ACT score is less than 24 months old. Topics included in this three-credit-hour course are solving equations and inequalities, lines and circles, systems of equations, functions and their graphs, inverse functions, and polynomial, rational, exponential, and logarithmic functions with applications. Class meets once a week for fifty minutes at a scheduled time. Students are required to spend a minimum of three flexible hours each week in the LSU Math Lab doing their math work. Homework, quizzes, tests, and the final exam are completed online using MyLab™ Math.

## Challenges and Goals

LSU data have shown that students who are successful (earning a final grade of A, B, or C) in College Algebra their first semester at LSU have higher overall retention and graduation rates than students who are unsuccessful (earning a final grade of D, F, or W). Experience has also shown that a low score on Test 1 in College Algebra is an early indicator of lack of success in the course.

An intervention program was created in Fall 2013 to give students the opportunity to learn the content they did not learn for Test 1, which covers solving basic equations and inequalities. The motivation behind the opportunity was that all students (regardless of their score on Test 1) would be given a chance to complete the required criteria between the fifth and ninth weeks of the semester and retake Test 1 the tenth week of the semester. These required criteria were designed to guide students through the process of learning the math needed for a good score on Test 1, which in turn would give the students a better foundation for (1) the remainder of the course content, (2) the final exam in the course, and (3) subsequent courses.

## Implementation

### Class participation

Class meets once a week for fifty minutes at the scheduled time. In class, the instructor presents an overview of the work for the week. Students receive a participation grade for each class meeting and class participation is worth five percent of their final course grade. Students must attend for the full class period, take notes, pay attention, and stay awake to earn a grade of 100 percent. If they fail to

meet these requirements throughout the 50-minute class meeting, they receive a grade of 0 for that class meeting. Students are allowed an excused absence if they have a documented university excuse and notify their instructor within one week of the absence with documentation.

### **Lab participation**

Lab participation in the LSU Math Lab is required, and it is worth five percent of the course grade. The LSU Math Lab is open from 9 a.m. to 9 p.m. Monday through Thursday and from 9 a.m. to 5 p.m. on Friday. Students must work in the LSU Math Lab a minimum of three hours each week in addition to the scheduled class time, and they must follow all LSU Math Lab rules to earn a grade of 100 percent. If they fail to meet the lab participation requirement for a specific lab week, a grade of 0 is received for that week. Visits must be officially recorded by the tutor at the front desk of the LSU Math Lab for the time to count towards the lab participation grade. This is done by swiping the student's LSU ID card when entering and leaving the lab.

During lab time, students are expected to read the eText, study class notes, watch LSU-created videos, do homework, take quizzes, work the "Practice What You Missed on Test x" assignments, and repeatedly work the Practice Tests until they are certain they have mastered the material. Students are strongly encouraged to interact with teachers, tutors, and other students in the LSU Math Lab in order to get individualized, immediate answers to their questions. Students are only allowed to do their College Algebra work or related activities (such as reading the eText, scheduling a test, or watching a math video) while they are in the LSU Math Lab. The penalty for violating this rule is being asked to leave the LSU Math Lab for the remainder of that day and receiving a zero in lab participation for that week even if all required hours have been completed.

*"The features of MyLab Math are all effective, but the real power comes from the ability to combine them into an automated program that fills our needs."  
—Phoebe Rouse, Director of Precalculus Mathematics, Louisiana State University*

The following are descriptions of course components completed within MyLab Math:

### **Syllabus Quiz**

Students must complete a Syllabus Quiz, covering the contents of the syllabus, with a score of 100 percent before they are able to open any graded assignments in MyLab Math. This is set up through the [prerequisites](#) function in MyLab Math. The quiz does not count toward the final course grade.

### **Homework**

Students are encouraged to review their class notes and read the eText before attempting the homework. Homework assignments are due at 9:00 p.m., though due dates vary by section. While homework can be done from anywhere using MyLab Math, the preferred location is the LSU Math Lab. Students are allowed to re-work exercises an unlimited number of times until they have mastered the concept. There are different types of homework exercises (table 1). For each type, the result of the student's last attempt for each exercise is recorded.

Type of Exercise	Features
Skill Check Standard Step by Step Brief	<ul style="list-style-type: none"> <li>• Learning aids usually available</li> <li>• In general, three attempts allowed for each iteration with feedback after each</li> <li>• Similar Exercise (new iteration for same exercise number) available unlimited number of times</li> <li>• Tutors in lab can assist with these exercises</li> </ul>
Reading Assessment	<ul style="list-style-type: none"> <li>• Learning aids not available</li> <li>• Can be attempted only two times with feedback after each</li> <li>• Similar Exercise not available</li> <li>• Multiple choice, usually found at the end of each homework assignment, 3-7 questions</li> <li>• Tutors in lab cannot assist with these exercises</li> </ul>

Table 1. MyLab Math Exercise Types and Features

Students are cautioned that if they rely on the MyLab Math learning aids or other help to get a Skill Check, Standard, Step-by-Step, or Brief exercise correct, then they should use the Similar Exercise feature and rework the exercise repeatedly until they can get it correct without any help. Instructors insist that this is essential. “Many students who become overly dependent on the learning aids or other assistance to get a score of 100 percent on the homework assignment find that they score much lower on the tests,” Phoebe Rouse, Director of Precalculus Mathematics, states, “so we strongly encourage them to make sure they’re not using the aids as a crutch but rather as what they’re intended for — a learning tool. Then they should ensure they actually understand the content by completing the problem without any help.” The two lowest homework assignment grades are dropped.

While graded homework for each section has due dates and closes at that time, a copy of the homework assignment (labeled Practice Homework) is open throughout the semester to be used for studying. The Practice Homework does not count toward the final course grade. Utilizing [Personalized Homework](#) in MyLab Math, an additional practice homework assignment called “Practice What You Missed on Test x” is created when students submit each test. This does not count toward the final course grade, but students are encouraged to use it to practice what they missed on the test in preparation for the final exam.

### Quizzes

Students are encouraged to master their homework before attempting the quizzes. They are also instructed to try to do the quizzes without any help, with the caution that if they rely on help to get a score of 100 percent on the quizzes, they will score much lower on the tests. Quizzes are due at 9:00 p.m. with varying due dates by section. Like homework, quizzes can be taken from anywhere using MyLab, but the preferred location is the LSU Math Lab.

Unlike homework exercises, students do not receive feedback after each exercise answer is entered. Instead, they must work through the quiz and submit it before seeing their score. Students are allowed to review their quiz in the MyLab gradebook, and learning aids will appear for the review. Quizzes are intended to be used as preparation for tests, and students are encouraged to retake the quizzes until they can do the work correctly without any assistance from tutors, notes, the eText, or the MyLab Math learning aids.

Using MyLab Math's [question pooling](#) feature, each quiz contains ten questions with each question drawn from a pool of exercises having the same or similar learning objectives. It is recommended that students take a quiz at least four times, even if they earn a score of 100 percent on the first, second, or third attempt, to ensure that they see a variety of the exercises. Each quiz can be attempted up to ten times prior to the due date, but only the highest score for each quiz is recorded. The lowest two quiz grades are dropped. Quizzes are timed at 75 minutes.

### **Tests and Final Exam**

There are four test scores and a final exam. The final exam score counts as 25 percent of the course grade and replaces the lowest test score if it is higher than one of the four test scores. The proctored, password-protected tests and final exam must be scheduled online and taken on campus. Each test and the final exam have a specific window in which they can be taken, and students may select the day and time within that window to take them as long as a seat is available. Students who do not schedule their exams according to course policy are not allowed a make-up under any circumstances; however, if a scheduled test is missed, a makeup may be considered depending on the circumstances.

After completing all homework and quizzes, students are expected to prepare for tests and the final exam by repeatedly practicing until they can get all exercises correct without any assistance from MyLab learning aids, notes, the eText, or tutors. Practice Tests and a Practice Final Exam are available in MyLab for each test and are open throughout the semester. They do not count toward the final course grade, but Rouse maintains it is essential that students work the Practice Tests repeatedly until they can do the work without any help. Students are not allowed assistance of any kind on a test or on the final exam, including notes, formula sheets, MyLab work, or any other type of outside help. Students do not get feedback after each exercise answer is entered and must work through the entire test and submit it before seeing the score. Students can review their test in the MyLab gradebook, and the MyLab learning aids will appear for the review. Only one attempt is allowed for each test and for the final exam. Tests are timed at 90 minutes and the final exam is timed at 120 minutes.

### **Test 1 Retake Program**

When the program was first initiated, course coordinators had to meet individually with students to help them know what to study. Realizing quickly that this process would not scale up reasonably, they decided to remove that requirement and add a quiz with an associated required practice test. Because of the prerequisites and personalized homework features in MyLab Math, the Test 1 Retake Program is now automated. The retake program is available to all students and is optional; however, in order for the retake to open, students who opt to participate must follow all of the steps below.

#### **Step 1: Homework**

After reviewing Test 1 in the MyLab Math gradebook, the student should complete the personalized homework assignment in MyLab Math titled "Practice What You Missed on Test 1." As always, students may attempt the homework exercises an unlimited number of times with the exception of the Reading Assessment questions, which may only be attempted twice before being permanently marked wrong. Using the prerequisite function, students must earn a score of at least 90 percent on this homework assignment in order to have the assessment in Step 2 available to them in MyLab.

### Step 2: Quiz

After completing Step 1, students may begin working the quiz in MyLab Math titled “Most Frequently Missed Questions on Test 1.” Coordinators use the Item Analysis function in MyLab Math to identify the most commonly missed questions on Test 1 and assign them. Question pooling is utilized to vary the specific exercise chosen for each question. Students may attempt this quiz an unlimited number of times, and a prerequisite exists, requiring the student to earn a score of at least 80 percent on this quiz in order to have the assessment in Step 3 available to them in MyLab Math.

### Step 3: Practice Test

After completing Step 2, students begin working the test in MyLab Math titled “Practice Test 1 Retake.” Question pooling is used to vary the specific exercise chosen for each question, and this test is a copy of the actual test with some of the pooled questions separated. Students may attempt this test an unlimited number of times and are encouraged to continue taking this practice test without any assistance from learning aids, notes, tutors, etc., until they have reached or exceeded the score they are attempting to earn on their official Test 1 Retake. Utilizing the prerequisite function, a score of at least 70 percent must be earned on this practice test in order to have Test 1 Retake made available in MyLab Math.

### Step 4: Test 1 Retake

After completing Step 3, the Test 1 Retake automatically becomes available to them. Question pooling is used once again to vary the specific exercise chosen for each question. The score on the Test 1 Retake automatically replaces the original Test 1 score, whether it is higher or lower than their original score.

## Assessments

- 45% Tests (four at 11.25% each; lowest replaced with final exam if higher)
- 25% Final exam (cumulative, never dropped)
- 10% Quizzes (lowest two of 14 scores dropped)
- 10% Homework (lowest two of 25 scores dropped)
- 5% Class participation
- 5% Lab participation

The course grading scale is as follows:

A+: 98–100%	A: 93–97%	A-: 90–92%	
B+: 88–89%	B: 83–87%	B-: 80–82%	
C+: 78–79%	C: 73–77%	C-: 70–72%	
D+: 68–69%	D: 63–67%	D-: 60–62%	F: 0–59%

## Results and Data

To assess the impact the Test 1 Retake program had on students, data from Fall semesters 2013–2017 (table 2) were analyzed and then compared to performance in semesters prior to its availability (2006–2012) (figure 1). Figure 1 shows that once the Test 1 Retake Program was offered, average drop rates remained consistent, final exam median increased three percentage points, and the average ABC rate increased one percentage point.

Semester	Number of Students with D/F on Test 1	Percent of Students with D/F on Test 1 who Participated in Retake Program	Average Point Increase from Test 1 to Retake of Test 1	Course Success (ABC) for Retake Program Students	Overall Course Success (ABC) Rate
Fall 2013	829	32%	22	80%	76%
Fall 2014	800	32%	23	82%	75%
Fall 2015	913	37%	19	70%	73%
Fall 2016	1011	37%	23	72%	68%
Fall 2017	896	36%	21	70%	68%
<b>Average</b>	<b>890</b>	<b>35%</b>	<b>22</b>	<b>75%</b>	<b>72%</b>

Table 2. Test 1 Retake Program Data Points

### Course performance before and after Retake Program

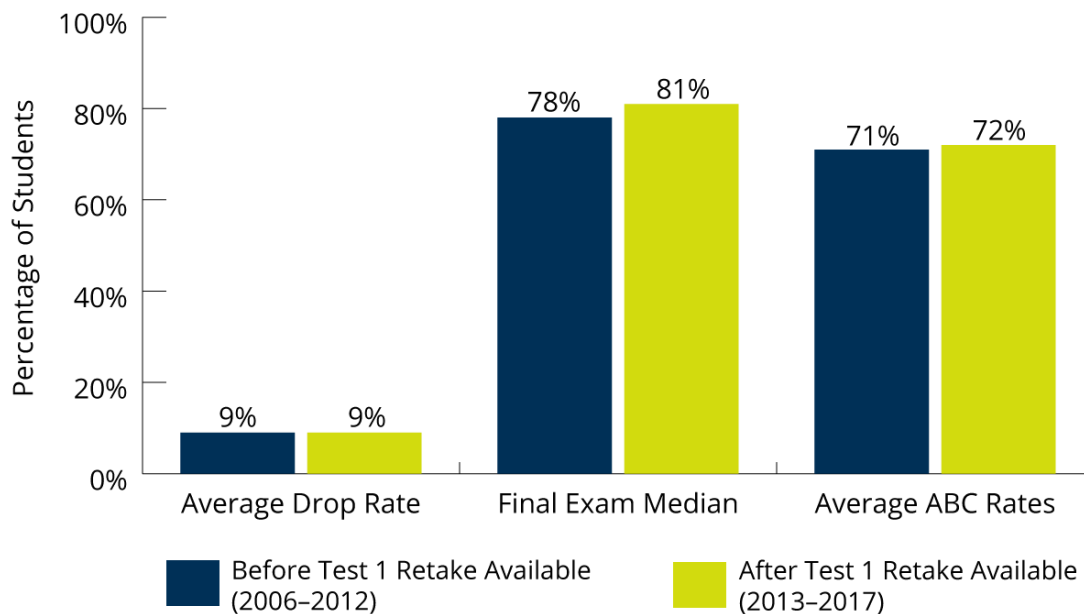


Figure 1. Course Performance Before Test 1 Retake Available, Fall Semesters 2006-2012 ( $n=11,994$ ) and After Test 1 Retake Available, Fall Semesters 2013-2017 ( $n=8,179$ )

Figure 2 shows (1) that of the students who earned a D or F on the first test, 35 percent actually retook the test; however, (2) 75 percent of those students who did retake the test had success (A/B/C) in the course, juxtaposed against the 41 percent of non-retaking students achieving the same success. Therefore, it stands to reason that if the remaining 65 percent of D/F students took advantage of the retake program, overall course success rates might possibly rise. The data in figure 2 is encouraging, showing that overall course grades might improve as a larger percentage of students take advantage of the program.

## Course success and retake participation for students earning D/F on Test 1

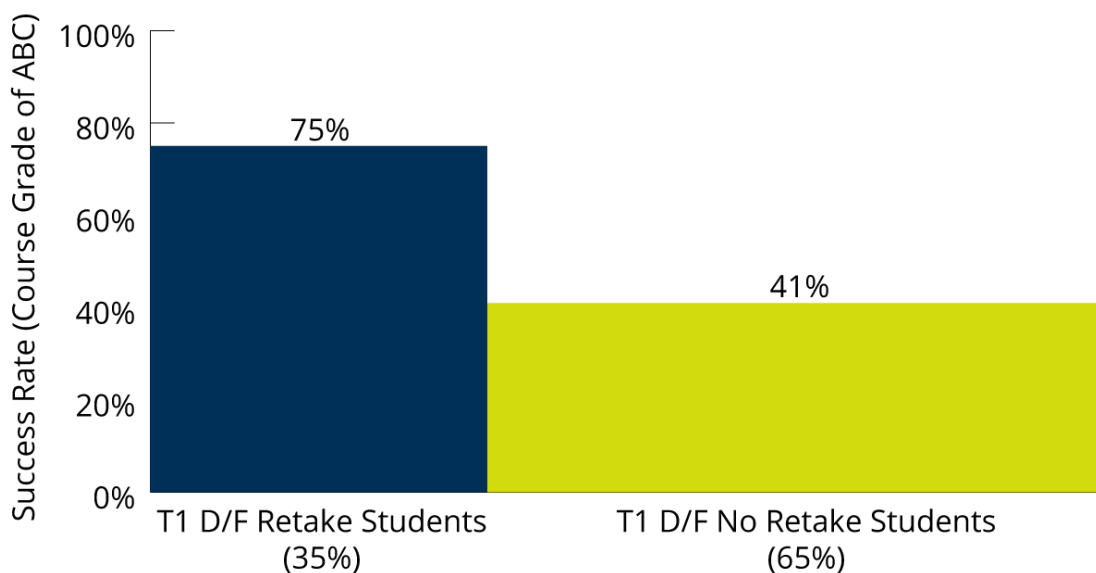


Figure 2. Course Success (ABC) Rate and Percentage of Students Who Earned D/F on Test 1 Retaking Exam ( $n=1,555$ ) vs. Not Retaking ( $n=2,894$ ), Fall semesters 2013–2017, ( $N=4,449$ )

## The Student Experience

Phoebe Rouse, Director of Precalculus Mathematics, lets students know that if they make an A or B on the first test, there is no need for them to retake it. She and her coordinators explain that students who make Cs should only participate in the retake program if they're positive they can make a better grade the second time, because the second grade counts no matter what. "The C students need to determine why they earned a C on that first test," Rouse states. "If they goofed off and didn't take it seriously, then they should probably remediate and take advantage of it. We really encourage the D and F students to take advantage of the program." Rouse believes that the low percentage of students who earn a D/F on Test 1 participating in the program is because, she admits, it takes a lot of work. "The other thing is," she explains, "we have a grading system where the final exam score, of which 25 percent of the exam content is from Test 1, can also be used to replace the lowest test score, so some people decide, rightly or wrongly, that they don't have time to do the retake program, thinking they can score better on the Final Exam." She says that responses to informal polls of students asking why they don't participate in the program are usually, "I don't have time", while some are, "I just don't feel like it."

However, there are some encouraging stories from students who do take advantage of the program. Debra Kopcso, College Algebra Coordinator and Instructor, tells of one student in particular who had something happen that made it impossible for her to keep up with the material included on the first test and, subsequently, made a 20.5 percent on it. The student participated in the Test 1 Retake Program and made a 74.5 percent on the retake. Kopcso reported that the student had a much more positive attitude towards the course after seeing that success was attainable and went on to earn a final grade of B+. "I don't believe that would have happened if this student hadn't participated in the Test 1 Retake Program," states Kopcso.



## Conclusion

“People who take advantage of this opportunity are rewarded greatly. It could be the difference in passing and failing a course.”

—Phoebe Rouse, Director of Precalculus Mathematics, Louisiana State University

Because experience has shown that a low score on Test 1 in College Algebra is an early indicator of lack of success in the course, Rouse and her colleagues created an intervention program designed to give students the opportunity to retake the first test after remediating and learning the material they failed to understand the first time. The goals for the program were to give the students a better foundation for (1) the remainder of the course content, (2) the final exam in the course, and (3) subsequent courses. Data show that Test 1 D/F students who participated in the Test Retake Program had an average Test 1 increase of 22 points and an average success (ABC) rate of 75 percent, compared to an overall course success rate of 72 percent.

Rouse believes, “None of this would work if we didn’t have Personalized Homework, Item Analysis, Question Pooling, and Prerequisites. I don’t want to sound like a MyLab commercial, but in truth, we didn’t do this before because we didn’t have all of these features in MyLab, but now we do. The features of MyLab Math are all effective, but the real power comes from the ability to combine them into an automated program that fills our needs.”

The next step, Rouse believes, is to get more students who earn a D/F on the first test to take advantage of the program. She states, “People who take advantage of this opportunity are rewarded greatly. It could be the difference in passing and failing a course. That’s huge, and we need students to understand this so that more will do the work necessary to take advantage of the offer we’re giving them.”