

# LimeSpring

## CUNY Student Success Study



Supporting Success in  
**Developmental Math**

## Abstract

Between May 2013 and November 2014, LimeSpring conducted an 18-month study with two community colleges in the City University of New York (CUNY) system to assess the impact of LimeSpring on student outcomes. As part of the study, matriculating freshmen requiring remediation, multiple-repeat students (students with at least two prior failures in remedial math at the college level), and students with special needs were provided LimeSpring materials in place of conventional course materials. The curriculum for each program was designed by CUNY faculty, and then LimeSpring content was matched to the course curriculum. Two metrics were measured during the program and used to assess success: student retention, as measured by the percentage of students completing the course and sitting for the CUNY departmental exit exam, and student pass rate, as measured by student success on the exit exam. 85% of matriculating freshmen ( $n = 282$ ) completed the course, and 87% of students passed the exit exam. 83% of multiple-repeat students ( $n = 375$ ) completed the course, and 84% of students passed the exit exam. 77% of students with special needs ( $n = 44$ ) completed the course, and 68% passed the exit exam. Results in subsequent math courses were only available for multiple-repeat students, who passed their next credit-bearing math course with an 89% pass rate. The results of the study suggest that LimeSpring has a significant positive impact on improving the understanding and pass rate of students across all three categories of participants. As compared to the historical retention rates (~60%) and pass rates of remedial students (~40%) and students with special needs (~26%), students using LimeSpring exhibited a significant improvement in completion and success.

## Introduction

Approximately 70% of matriculating freshman are deemed not college ready and, therefore, must complete remediation prior to enrolling in college level courses. Of this 70%, only one in four are reported to graduate within six years of enrollment. Additionally, a recent study found that while nearly half of students complete their remedial reading sequence, only one in three students complete their remedial math sequence. When compared to the 40% graduation rate of non-remedial students, it is clear that remedial math poses one of the biggest barriers to student success. To address poor student outcomes, LimeSpring partnered with two community colleges in the CUNY system to conduct a study comparing the success of students using LimeSpring to that of students using the conventional course content.

## LimeSpring Platform

Based on research conducted at the Johns Hopkins University, LimeSpring's proprietary platform was developed by experienced educators, computer scientists, and researchers to maximize learning and retention. Its primary focus is on delivering high quality content in an engaging learning environment: LimeSpring's lessons are self-paced, ensure students understand the content before progressing, and address each student's individual learning preferences. Concepts are packaged into ten to fifteen minute lessons that are professionally animated to optimize cognitive load throughout the duration of the lesson. Every five to seven minutes, students are challenged by in-lesson quizzes to ensure understanding, encourage engagement, and break the lessons into shorter segments that are reflective of human attention spans.

## Methods

193 matriculating freshmen who had placed into remedial math classes based on their performance on the ACT Compass exam were enrolled in an eight-week LimeSpring program over the summer following their senior year of high school. The program took place entirely online, and students were expected to commit between four and six hours per week. Three to five of the hours included students working through the LimeSpring materials for that week on their own schedule and at their own pace. The remaining hour was spent in a prescheduled online session with an instructor who reviewed the key concepts and learning objectives for that week and answered questions.

Participating students were placed into either a prealgebra or an elementary algebra class based on their performance on the Compass exam. Students who were deemed high failures on the prealgebra exam were given the opportunity to expedite their program and complete both semesters of math by taking a prealgebra exit exam during the fifth week of the program. Students who failed the exit exam were given the opportunity to re-enroll in an extra two-weeks of mastery-based instruction and then permitted to take an alternate version of the exit exam.

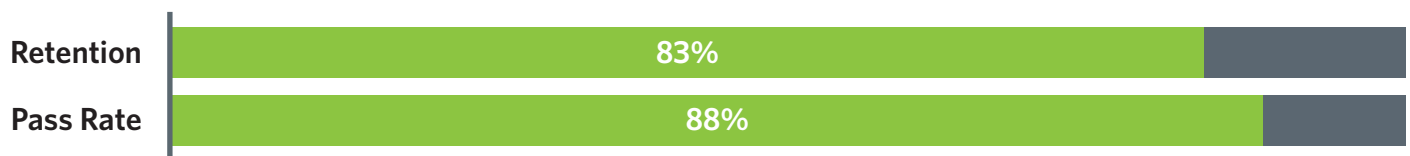
Historical student retention (~60%) and success (~40%) rates in remedial math, which is provided on-campus through a fourteen-week course, were used as the control. The retention rate was determined based on the percentage of students completing the course and sitting for the departmental exit exam. The success rate was determined based on the percentage of students passing the departmental exit exam.

## Results

Of the 193 students who enrolled, 160 students (83%) completed the LimeSpring program and sat for the exit exam, and 141 of those students (88%) passed at least one semester of remediation. 29 students passed prealgebra, 44 students passed elementary algebra, and 68 students passed both prealgebra and elementary algebra. During the eight-week program, the 193 students attempted a total of 282 semesters of remedial math and passed 209 semesters of remedial math (87%). The tables and graph below summarize the results of the students.

	Enrolled	Completed	Passed
Prealgebra	127	109	97
Algebra	66	51	44
Algebra (2 semesters)	89	79	68
Total	282	239	209

	8-Week	2-Week Ext	Failed
Prealgebra	72	25	12
Algebra	97	15	18
Total	169	40	30



## Methods

375 multiple repeat students, students who had failed remedial math at the college level at least twice, were enrolled in an eight-week LimeSpring program. The program took place entirely online, and students were expected to commit between four and six hours per week. Three to five of the hours included students working through the LimeSpring materials for that week on their own schedule and at their own pace. The remaining hour was spent in a prescheduled online session with an instructor who reviewed the key concepts and learning objectives for that week and answered questions.

Participating students were placed into either a prealgebra or an elementary algebra class based on their requirements. Students who failed the exit exam were given the opportunity to re-enroll in an extra two-weeks of mastery-based instruction and then permitted to take an alternate version of the exit exam.

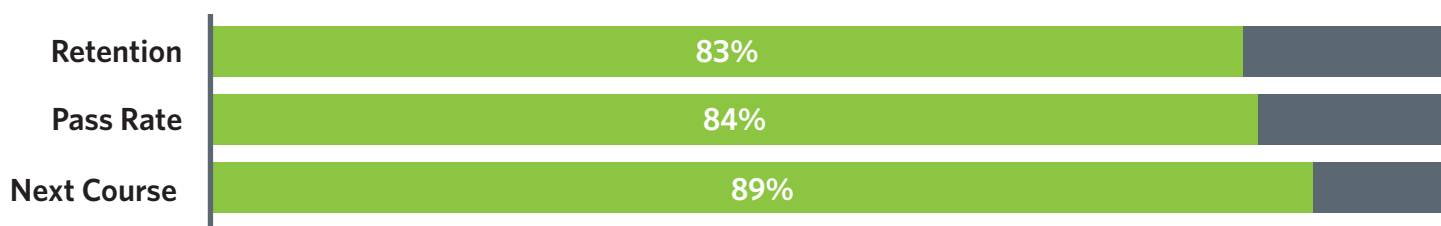
Historical student retention (~60%) and success (~40%) rates in remedial math, which is provided on-campus through a fourteen-week course, were used as the control. The retention rate was determined based on the percentage of students completing the course and sitting for the departmental exit exam. The success rate was determined based on the percentage of students passing the departmental exit exam.

## Results

Of the 375 students who enrolled, 312 students (83%) completed the LimeSpring program and sat for the exit exam, and 262 of those students (84%) passed. 60 students passed prealgebra, and 202 students passed elementary algebra. Of the students who took a semester of credit bearing math after passing the LimeSpring program, 89% passed. The tables and graph below summarize the results of the students.

	Enrolled	Completed	Passed
Prealgebra	88	75	60
Algebra	287	237	202
Total	375	312	262

	8-Week	2-Week Ext	Failed
Prealgebra	48	12	15
Algebra	177	25	35
Total	225	37	50



## Methods

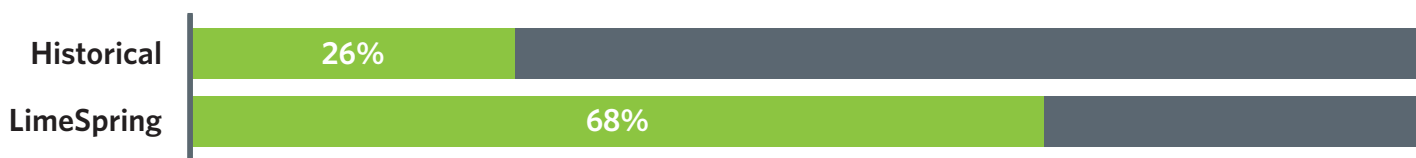
44 students with special needs were enrolled in a fourteen-week elementary algebra LimeSpring program. The hybrid program took place in a computer lab on campus with a faculty member and a supporting instructor. Students spent three 2-hour sessions per week in the lab working through the LimeSpring materials at their own pace, supported by the faculty member and instructor.

Historically, ~26% of students with special needs pass elementary algebra, which is provided on-campus through a fourteen-week course. The retention rate was determined based on the percentage of students completing the course and sitting for the departmental exit exam. The success rate was determined based on the percentage of students passing the departmental exit exam.

## Results

Of the 44 students who enrolled, 34 students (77%) completed the LimeSpring program and sat for the exit exam, and 23 of those students (68%) passed. The table and graph below summarize the results of the students.

	Enrolled	Completed	Passed
Algebra	44	34	23



## Discussion

In each of the three student groups, matriculating freshmen, multiple-repeat students and students with special needs, the retention and success rates of participants in the LimeSpring program significantly exceeded those of students in the control group. As compared to the control group, matriculating freshmen experienced a 41% increase in retention and a 119% increase in success. As compared to the control group, which includes students who have never failed remedial math and students with one failure, multiple-repeat students - students with at least two failures - experienced a 39% increase in retention and a 110% increase in success. As compared to the control group, students with special needs experienced a 29% increase in retention and a 171% increase in success. The multiple-repeat students - the only students for whom data was provided - who subsequently took a credit bearing math course passed the course with an 89% success rate.

The results of the study suggest that LimeSpring has a significant impact on improving student retention and success in remedial math. Additionally, strong student outcomes in subsequent math courses suggest that students are developing an understanding of fundamental math concepts and are better prepared for subsequent math courses after completing a LimeSpring program. The 44 students with special needs showed drastic improvements by using LimeSpring, and a follow-on study is being conducted to increase the population size to better understand LimeSpring's impact on success.

To learn more about LimeSpring or the CUNY study, please contact the LimeSpring team at [support@limespring.com](mailto:support@limespring.com).

LimeSpring lessons are designed to be modular. That way teachers can easily rearrange them to match their course's curriculum.

## Math Fundamentals

1. Adding and Subtracting Negative Numbers
2. Multiplying and Dividing Negative Numbers
3. Order of Operations
4. Factoring Numbers

## Fractions

1. Introduction to Fractions and Mixed Numbers
2. Simplifying Fractions
3. Multiplying Fractions
4. Dividing Fractions
5. Multiplying and Dividing Mixed Numbers
6. Adding Fractions
7. Subtracting Fractions
8. Adding and Subtracting Mixed Numbers
9. Comparing Fractions
10. Using Fractions to Solve Problems

## Decimals

1. Introduction to Decimal Numbers
2. Adding and Subtracting Decimals
3. Multiplying and Dividing Decimals
4. Powers of 10

## Ratios & Percentages

1. Introduction to Ratios
2. Using Ratios to Solve Problems
3. Introduction to Percentages
4. Using Percentages to Solve Problems

## Exponents & Radicals

1. Operations Involving Exponents
2. Raising Exponents to Exponents
3. Negative Exponents and the Zero Power
4. Square and Cube Roots

## Solving Equations & Inequalities

1. Introduction to Algebra
2. Mathematical Properties
3. Solving Equations
4. Introduction to Inequalities
5. Solving Inequalities
6. The Union and Intersection of Inequalities
7. Solving Compound Inequalities
8. Introduction to Systems of Equations
9. Solving Systems of Equations Using the Substitution Method

## Graphing

1. Introduction to Graphing
2. Graphing Equations Using Points
3. Graphing Equations Using Intercepts
4. The Slope-Intercept Form of a Line
5. Graphing Equations Using Slope and Intercept

## Polynomials

1. Introduction to Polynomials
2. Adding and Subtracting Polynomials
3. Multiplying Polynomials
4. Dividing Polynomials

## Factoring Polynomials

1. Introduction to Factoring Polynomials
2. Greatest Common Factors
3. Difference of Two Squares
4. Factoring Trinomials
5. Factoring by Grouping

## Other Materials...

1. Circle, Cylinder and Sphere Geometry
2. Fundamentals of Statistics
3. Solving Quadratics
4. Units of Measurement
5. Solving Rational Equations

**If we are missing content from your course, we'll be happy to work with you to create what is needed.**