

# MyLab Math educator study examines impact of personalized learning and video notebook in Introduction to Algebra at Saint Xavier University

<p><b>School name</b> Saint Xavier University, Chicago, IL</p> <p><b>Course name</b> Introduction to Algebra</p> <p><b>Course format</b> Emporium</p> <p><b>Course materials</b> MyLab Math for <i>Beginning &amp; Intermediate Algebra</i> by Martin-Gay</p>	<p><b>Timeframe</b> Fall 2016–Spring 2017</p> <p><b>Educator</b> Christopher Riola, Adjunct Instructor</p> <p><b>Results reported by</b> Julianne Labbiento, Customer Outcomes Analytics Manager</p>
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## Key Findings

- Data show an 80 percent pass rate for the course, with two-thirds of students earning an A or B.
- Students who scored above the average on their video notebook earned an average of 43 percentage points higher on other assessments in the course.
- After completing required personalized MyLab remediation, students increased their practice test scores an average of 9 percentage points and chapter exam scores an average of 21 percentage points from first to final attempt.

## Setting

[Saint Xavier University](#), founded in Chicago by the Sisters of Mercy in 1846, is Chicago's oldest Catholic university and the first Mercy institution of higher learning in the United States. Initially serving as a higher education institution of women and the poor, today the four-year, private Catholic institution serves a diverse population of men and women who seek a Mercy education that prepares them to become successful, productive, and compassionate members of society. St. Xavier University supports a community that fosters student success, serving approximately 4,000 students at two campuses and awarding both undergraduate and graduate degrees. [Data for the 2016–2017 academic year](#) reported that 66 percent of students were female, and 54 percent identified as minorities.

## About the Course

The Introduction to Algebra course at Saint Xavier University is a three-credit, self-accelerated mastery-based learning course. It is designed to help students acquire the skills necessary for success in Intermediate Algebra and does not count toward a degree. Topics include problem solving with whole numbers, fractions and decimals, ratio, proportion, percent, and integers and an introduction to algebra. The use of both calculators and computers is integrated into the course content. A TI-83 plus or TI-84 plus graphing calculator is required, as well as a dedicated math notebook and earbuds or headphones. Placement is by the Mathematics Department. Students not completing the course by the end of the semester may re-enroll in the subsequent semester and continue where they left off. Students completing the course prior to three weeks from the end of the semester may immediately begin to take the Intermediate Algebra course.

## Challenges and Goals

Saint Xavier University has used a self-accelerated format for Introduction to Algebra for quite some time, even before technology like MyLab™ Math was available. In the early years, students in the self-accelerated course did work at their own speed, but did so without a computer, completing exercises from the textbook with no instant feedback. Adjunct instructor Chris Riola says that faculty had difficulty seeing their students' errors immediately and sometimes wouldn't realize that there was a gap in knowledge until a student did poorly on an exam. When the original self-accelerated format yielded low pass rates, the course was redesigned to a traditional lecture format, but it too proved less than effective.

In 2009, Saint Xavier University adopted MyLab Math in an emporium format for its Introduction to Algebra course. With features such as prerequisites and early-alert aids, faculty hoped to be able to catch student issues early and keep less-prepared students from moving forward until they mastered prior material, while allowing more-prepared students to accelerate, potentially through multiple courses in one semester. Faculty also hoped that the variety of personalized learning tools in MyLab would aid in student success.

## Implementation

Introduction to Algebra meets three times per week for a total of six hours in a computer classroom and covers the first six chapters in the required textbook. Riola teaches approximately 26 students in each of his classes, with a professional assistant also available in the classroom. Riola feels it is important to share with his students the key aspects of his mastery learning approach. On his syllabus, he notes:

- Mastery learning is a clearly defined way to success in mathematics based on a building block-approach to mathematics.
- You can move on to the next section when you've mastered the homework in the previous section.
- You can do a practice test when you've mastered the homework in all sections in a chapter.
- You can do the chapter exam when you've mastered the practice test.
- You can move on to the next chapter when you've mastered the previous chapter exam.
- You can pass the course when you've mastered exams for all six chapters.

Beginning on the first day of class, Riola emphasizes that there is a lot of flexibility in scheduling and proceeding through the course. However, he cautions students that if they fall behind and don't earn mastery on all six chapter exams, they will fail the course. He reminds them that it is very important to stay close to the course schedule to ensure that they finish successfully in the current semester. Per the syllabus, students are expected to complete a chapter about every two weeks. Students appreciated the schedule and advice, saying, "I was able to put more focus into specific areas of algebra I used to struggle in," and, "it has helped me to pace myself and figure things on my own." MyLab course shells are built from one master shell, so all assessments are standardized across course sections. Riola states, "The group of faculty teaching the course is very committed to the process, so there are no issues with maintaining course consistency."

Students begin the course by watching the MyLab objective videos and reading the textbook and taking notes on each. They are required to complete all of the example problems within each section on their own, rather than just read them, to ensure that they have a good understanding of the steps to completion. One student noted, "The videos are very helpful. You can pause, speed up, or slow [them] down to help you." Notes and work for the examples must be kept neatly in clearly-labeled sections of a spiral notebook or three-ring binder. The notebook is submitted when a student is ready to take a chapter test and is worth 20 points per chapter exam.

Once students have finished taking notes and working example problems, they proceed to the MyLab homework assignment for that section. Homework must also be completed neatly in their notebook. Riola uses the [multiple prerequisite feature](#) in MyLab to require mastery of at least 90 percent on homework assignments before students are allowed to move on to the next section and 100 percent on homework assignments before students may take the practice test at the end of a chapter. Since each homework has unlimited attempts, students are able to return to assignments as often as necessary to practice problems and to raise their scores to the required levels, depending on where they are in the chapter.

After completing the homework assignments to 100 percent mastery for all sections in a chapter, students move on to the MyLab practice test. Practice tests may be taken either in or out of the classroom, with all work recorded clearly in the notebook. Riola sets the mastery level for practice tests at 80 percent. If a student does not pass the practice test with at least 80 percent, a [personalized homework](#) is generated containing those problems missed on the test. A student must earn 100 percent on this individualized homework to be eligible to attempt the practice test again. This process continues until the student earns the required 80 percent on the practice test. Students are not allowed to ask questions while taking the practice test, as Riola wants the final score to be a true reflection of each student's understanding of the chapter's topics without assistance.

Chapter exams in MyLab can only be taken during class time in a proctored setting. A student who has earned 80 percent or higher on the practice test may take the chapter exam and will turn in the notebook at that time for grading. Students have 60 minutes to complete chapter exams and must show their work on colored paper. Work is expected to be neat and well-organized. Students submit their chapter exams electronically, but their work on the colored paper is graded as well and can influence their electronic score for any question. Riola says that a chapter exam score could go up (due to partial credit) or down (due to lack of work or mistakes in the work), depending on what is shown on the colored exam paper. Students are required to earn at least 70 percent on chapter exams. Students earning mastery on their first attempt may immediately move on to the next chapter in the course. For students who do not reach the 70 percent level, a [Companion Study Plan](#)

is automatically built in MyLab based on their performance on the exam. Once students complete their individualized study plans with 100 percent mastery, they may retake the chapter exam. If multiple attempts are necessary, the highest score on the chapter exam counts towards a student's final score.

Riola uses the MyLab gradebook tool [Search Email by Criteria](#) to identify groups of students at risk, such as those who scored low or did not complete a chapter test by the required date. This intervention allows him to help keep his students on target and provide just-in-time help before students fall behind. Students having difficulty may seek help from Riola and the professional assistant in the classroom, use the resources available inside the MyLab course itself, or visit Saint Xavier University's [tutoring center](#), which offers free tutoring for the course. The university also utilizes the online tutoring program [Smarthinking](#), which offers free tutoring available 24 hours a day and seven days a week, that is accessible via the university's learning management system, Canvas.

There is no single final exam. Instead, students must score at least 70 percent on all six chapter exams in order to pass the course. In addition, due to the ability to accelerate their learning, students who are able to finish the sixth chapter exam prior to the third week from the end of the semester may immediately begin taking the Intermediate Algebra course, which is also mastery based and self accelerated. The Intermediate Algebra course covers the remaining six chapters in the assigned text and, since the MyLab course shell is built for the entire textbook, all Intermediate Algebra content is available for students taking the Introduction to Algebra class, meaning that no additional access code is needed. It is possible for a student to complete both Introduction to Algebra and Intermediate Algebra in the same semester. Riola says that students able to complete both courses in one semester are awarded free tuition for one course in the subsequent semester, so there is incentive to finish early.

## Assessments

Final scores are calculated on a 1000-point scale as follows:

- 600 points Chapter exams (6 chapters/100 points each)
- 160 points Homework (35 assignments/1 per section)
- 120 points Video notebook/homework (6 chapters/20 points each)
- 120 points Practice Tests (6 chapters/20 points each)

For students who have earned at least 70 percent on all six chapter exams, final course grades are determined as follows:

- A: 90.0–100.0% (900–1000 points)
- B: 80.0–89.9% (800–899 points)
- C: 70.0–79.9% (700–799 points)

Any student who does not earn at least 70 percent on all six chapter exams will earn a final grade of F. In addition, any student registering ten or more absences will also earn a final grade of F.

## Results and Data

### Course success and subsequent course success

The Introduction to Algebra course is designed to guide students through content in the first six chapters of the assigned textbook using prerequisites and personalized learning features in MyLab to create an individualized learning path for each student. Data show an 80 percent pass rate for the course, with two-thirds of students earning an A or B (figure 1).

### Final course grade distribution

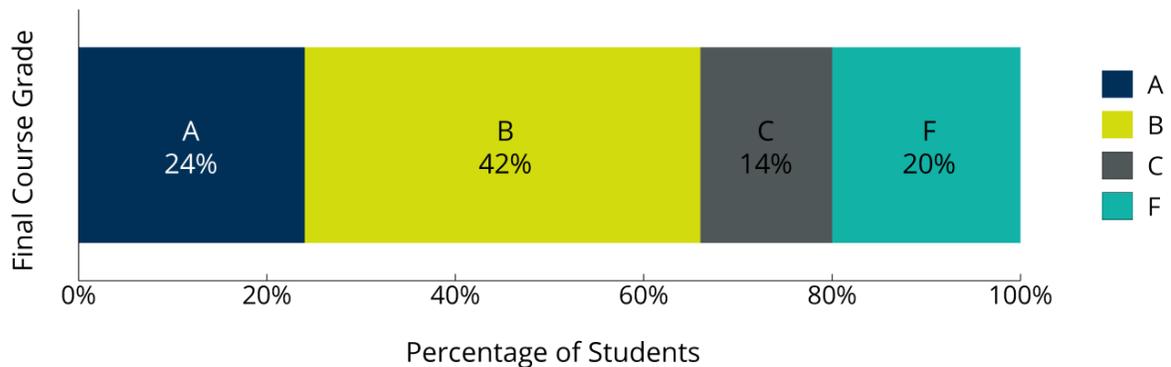


Figure 1. Final Course Grade Distribution in Fall 2016 and Spring 2017 ( $n=100$ )

One goal in using the emporium format for the course is to give students the ability to accelerate through multiple developmental courses in one semester. In Spring 2017, 45 of the 54 students (83 percent) originally enrolled in Riola's Introduction to Algebra classes successfully completed it, with 21 moving on to Intermediate Algebra in the same semester and six successfully completing that course as well (figure 2).

### Course completion rates in Spring 2017

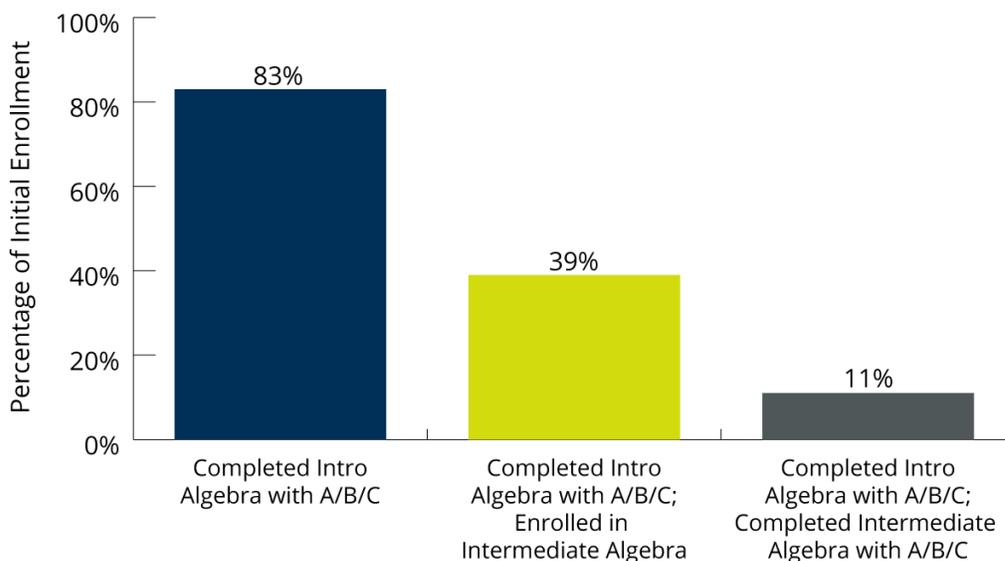


Figure 2. Course Completion Rates in Spring 2017 ( $n=54$ )

### Video notebook homework impact

Students begin each section by viewing videos, taking notes, and working example problems, keeping those neatly in a notebook that is submitted for grading when they complete each chapter. Guidance shared via the syllabus includes study skills suggestions to

1. View the videos, take notes, and work through the examples;
2. Follow up by reading the text and adding to those notes;
3. Write down important terms and definitions; and
4. Study the notes and questions throughout the course when something is unclear.

Analysis of the video notebook data for Fall 2016 and Spring 2017 showed that the average score for this assessment was 83 percent. Further analysis revealed that students who followed the studying guidelines and scored above the average on their video notebooks earned an average of 43 percentage points higher on other assessments in the course. These results were statistically significant for every course assessment, as well as for the final course score (figure 3).

- <sup>1</sup>Homework assignment scores:  $t(98)=9.21, p>0.001$
- <sup>2</sup>Practice test scores:  $t(98)=6.09, p>0.001$
- <sup>3</sup>Chapter exam scores:  $t(98)=9.45, p>0.001$
- <sup>4</sup>Final course scores:  $t(98)=10.18, p>0.001$

### Average scores based on video notebook average score

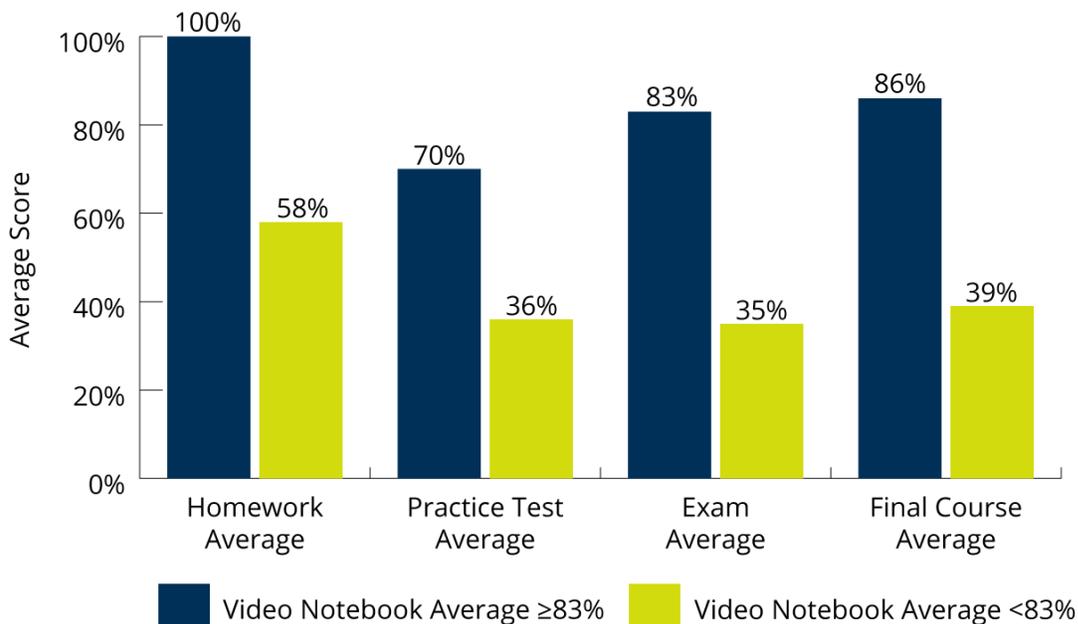


Figure 3. Average Scores Based on Video Notebook Average Score in Fall 2016 and Spring 2017; Average  $\geq 83\%$  ( $n=77$ ), Average  $<83\%$  ( $n=23$ )

### Personalized remediation between testing attempts

Riola's use of prerequisites and personalized learning was extensive and strategic. As they worked through the course content, students were continually being held to a level of mastery that Riola felt would ensure their best chance for success as they reached their practice tests and chapter exams. An analysis of the student practice test results showed that, with a maximum of six assigned practice tests each, the 100 students in the course sat for 427 practice tests. Data show that students were successful on first attempts of these practice tests 97 percent of the time, suggesting that Riola's

emphasis on video review, note taking, and the homework completion mastery requirement prepared students well when they initially took the practice tests.

Students not passing the first attempt of a practice test are required to complete a personalized homework reviewing the questions they missed. After earning 100 percent on that homework, they may sit for the practice test again. In a further review of the practice test data, eleven students were required to complete the remediation before an additional attempt. Data show that these students' scores increased by an average of 9 percentage points between their initial and final attempts on the practice tests.

A similar analysis was completed on students requiring multiple attempts to achieve the required 70 percent mastery on their chapter exams. These students were provided an individualized study plan as their remediation and, after earning 100 percent on that study plan, were able to retake the chapter exam. Data show that scores for students retaking chapter exams rose an average of 21 percentage points between their initial and final attempts (figure 4).

### Change in first attempt and final attempt scores

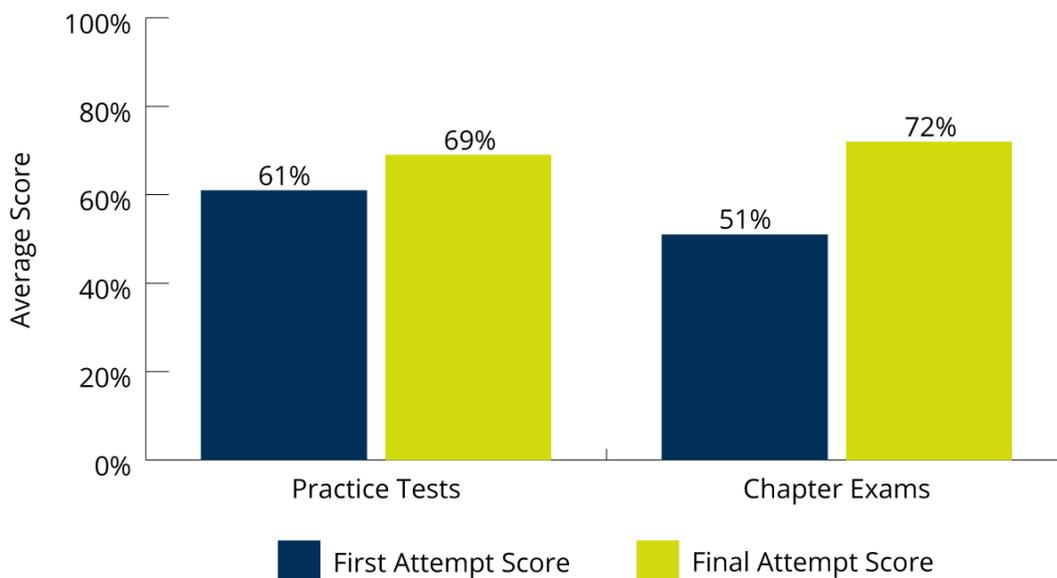


Figure 4. Change in First Attempt and Final Attempt Scores for Practice Tests ( $n=11$ ) and Chapter Exams ( $n=7$ ) in Fall 2016 and Spring 2017

### The Student Experience

Students in Riola's Spring 2017 Introduction to Algebra course were asked to complete a voluntary, end-of-semester survey (80 percent response rate) to share their perspectives on the courses and MyLab Math. Students were asked, "How helpful was MyLab Math?" Nearly three out of four students responded "helpful" or "very helpful" in every area asked, as summarized below:

How helpful was MyLab Math in:	Percent of respondents answering "helpful" or "very helpful"
Providing adequate practice to understand concepts	88 percent
Preparing me for exams	88 percent
Providing different ways to learn (ex. Videos, examples, textbook, etc.)	81 percent
Motivating me to learn	74 percent
Providing a positive learning experience	83 percent
Making me more confident in my ability to understand the concepts	81 percent
Preparing me to success in future courses	88 percent

When asked, "How has MyLab Math impacted your learning in this course?" students commented:

- *"The video based notes were individual and personalized and gave me the confidence to learn on my own. Overall it's been an excellent and empowering tool in becoming more confident in math."*
- *"I was able to put more focus into specific areas of Algebra I used to struggle in."*
- *"MyLab Math helped me learn quicker because I was able to go on my own pace, allowing me to stop and actually review something if i didn't understand it."*

## Conclusion

Chris Riola saw the benefits of the emporium format in his self-accelerated Introduction to Algebra course right away. He says that in a two-hour class period, students are now actively doing math nearly the entire time, and they are more willing to ask questions and share their struggles as he speaks with them in the one-on-one setting. Through the utilization of MyLab gradebook tools, he can identify his students' work habits and provide them with strategies to succeed. MyLab features such as prerequisites ensure that students take the time to remediate when necessary, while the personalized homework and companion study plan help them target their remediation efforts for maximum results. Finally, for students who are able, the self-accelerated format allows them to complete up to two developmental math courses in one semester and proceed to credit-bearing coursework more quickly.

<sup>1</sup>Homework Score *t*-Test Results: The group with higher than or equal to the mean score on the video notebook (M=100%, SD=1%, N=77) were significantly higher than the group with scores less than the mean (M=58%, SD=22%, N=23),  $t(98) = 9.21$ ,  $p < .001$ .

<sup>2</sup>Practice Test Score *t*-Test Results: The group with higher than the mean score on the video notebook (M=70%, SD=30%, N=77) were significantly higher than the group with scores less than the mean (M=36%, SD=21%, N=23),  $t(98) = 6.09$ ,  $p < .001$ .

<sup>3</sup>Exam Score *t*-Test Results: The group with higher than the mean score on the video notebook (M=83%, SD=7%, N=77) were significantly higher than the group with scores less than the mean (M=35%, SD=24%, N=23),  $t(98) = 9.45$ ,  $p < .001$ .

<sup>4</sup>Final Course Score *t*-Test Results: The group with higher than the mean score on the video notebook (M=86%, SD=6%, N=77) were significantly higher than the group with scores less than the mean (M=39%, SD=22%, N=23),  $t(98) = 10.18$ ,  $p < .001$ .