

An aerial, top-down view of a computer lab. Several students are seated at desks, each with a computer monitor and keyboard. The students are seen from behind, and their hands are visible as they interact with the computers. The desks are arranged in a grid pattern, and the overall scene is brightly lit.

MyLab[®] & Mastering[®]

Math & Statistics

MyMathLab • MyStatLab • MyLabsPlus

Educator Case Studies • 2016

MyLab & Mastering: Math and Statistics

Edited by Michelle D. Speckler and Publishing Services

©2016 Pearson

MyMathLab, MyStatLab, and MyLabsPlus are registered trademarks of Pearson.

www.pearsonmylabandmastering.com

Welcome Letter

Dear Educator,

At Pearson, we define **efficacy** as a measurable impact on improving lives through learning. We are embarking on a global education initiative and dedicating ourselves to the pursuit of efficacy and improved learner outcomes.

These studies were selected from both two- and four-year institutions, various implementation models, and both developmental math courses and a range of college credit courses. Findings from these case studies help us and educators understand the positive impact these implementations have had on the learner and provide valuable insights into common teaching and learning challenges. Further, a list of proven MyMathLab/MyStatLab best practices and tips for getting started with your own implementation follow the case studies. Please note that in order to prevent any possible conflict of interest, Pearson does not offer compensation for participating in a case study.

Looking for more case studies? Visit our **Results Library**, an online repository of more than 100 math- and statistics-specific case studies documenting the impact that educator best practices have had on student learning using our digital solutions. Filter by discipline, product, institution type, course format, or state/province to find a match.

We invite you to contact us with any questions about this report, as well as to share your ideas, your best practices, or your results using a Pearson digital solution. To learn more about partnering with us on a case study, please reference our new **Efficacy Support—Partnering with Pearson** document. We look forward to hearing from you!

Sincerely,

Traci Simons, *Senior Efficacy Results Manager*
traci.simons@pearson.com

John Tweeddale, *Senior Vice President, Efficacy and Quality*
john.tweeddale@pearson.com



Visit the Pearson
Results Library

www.pearsonmylab.com/results

Table of Contents

Welcome Letter	3
Efficacy Support—Partnering with Pearson	7

Developmental Math

Two-Year Community College

Front Range Community College, CO	9
---	---

Course Materials: MyMathLab and *Developmental Math*, Squires and Wyrick

Course: Two-semester developmental math sequence

Course Format: Hybrid: In-lab class plus independent lab hours; acceleration possible; mastery-based

Key Result Focus: Student progress, completion rates, and subsequent success rates

Key Features: Redesign and study plan

Schoolcraft College, MI	13
-------------------------------	----

Course Materials: MyMathLab and *Beginning & Intermediate Algebra*, Martin-Gay

Course: Intermediate Algebra

Course Format: Face-to-face

Key Result Focus: Final exam scores

Key Feature: Personalized homework

State College of Florida, FL	15
------------------------------------	----

Course Materials: MyMathLab and *Prealgebra & Introductory Algebra*, Elayn Martin-Gay plus Video Organizer

Course: Elementary Algebra

Course Format: Fully online; 8-weeks, self-paced, acceleration possible

Key Result Focus: Pass rates

Key Features: Redesign, lecture videos, and video organizer

Wor-Wic Community College, MD	18
-------------------------------------	----

Course materials: MyLabsPlus and *Developmental Mathematics Series*, Martin-Gay

Courses: Prealgebra, Elementary Algebra, Intermediate Algebra

Course Format: Emporium model

Key Result Focus: Pass rates

Key Feature: Prerequisites and deadlines with flexible pacing

Four-Year University

Liberty University, VA	22
------------------------------	----

Course Materials: MyLabsPlus and *Developmental Math* (custom edition), Squires and Wyrick

Courses: Fundamentals of Mathematics and Intermediate Algebra

Course Format: Emporium model with both open and scheduled lab; flexible pacing, mastery-based

Key Result Focus: ABC rates

Key Features: Redesign and personalized homework

Montana State University Billings, MT26

Course Materials: MyMathLab and *Elementary and Intermediate Algebra*, Carson and Jordan

Courses: Introductory and Intermediate Algebra

Course Format: Face-to-face with acceleration possible

Key Result Focus: Subsequent success rates

Key Features: Modularized course format with personalized homework

SUNY Old Westbury, NY.....31

Course Materials: MyMathLab and *Elementary Algebra: Early Graphing*, Angel

Course: PowerTrack Math (Elementary Algebra)

Course Format: Hybrid: lecture plus required lab hours; fixed due dates, open lab

Key Result Focus: Retention and subsequent success rates

Key Features: Redesign; required lab attendance

Wayne State University, MI34

Course Materials: MyLabsPlus (direct bill via course fee) and *Elementary Algebra: Concepts & Applications*, Bittinger

Course: Beginning Algebra

Course Format: Hybrid: scheduled meetings, open lab, fixed due dates

Key Result Focus: Pass rates

Key Feature: Personalized homework

Collegiate Math/Statistics

Two-Year Community College

Camden County College, NJ.....36

Course Materials: MyStatLab and *Elementary Statistics: Picturing the World*, Larson and Farber

Course: Introduction to Statistics

Course Format: Face-to-face

Key Result Focus: Homework completion rates and exam scores

Key Feature: Study Plan for extra credit

Ivy Tech Community College, IN38

Course Materials: MyStatLab and *Business Statistics: A First Course*, Levine, Krehbiel, Berenson & Stephan

Course: Business Statistics

Course Format: Fully online

Key Result Focus: Pass rates

Key Feature: Personalized homework

Reading Area Community College, PA.....44

Course Materials: MyStatLab, Learning Catalytics, and *Essentials of Statistics*, Triola

Course: Introduction to Statistics

Course Format: Combination of hybrid and fully online

Key Result Focus: Exam scores

Key Feature: Companion study plan

St. Philip's College, TX	47
Course Materials: MyMathLab and <i>Mathematics for the Trades</i> , Carmen and Saunders	
Course: Technical Math	
Course Format: Face-to-face	
Key Result Focus: ABC rates	
Key Feature: Custom question builder	
Four-Year University	
SUNY Old Westbury, NY.....	49
Course Materials: MyMathLab and <i>College Algebra</i> , Sullivan	
Course: College Algebra	
Course Format: Hybrid: lecture plus required lab hours	
Key Result Focus: Pass rates	
Key Feature: Students grouped based on curriculum path, fixed due dates	
Temple University, PA	52
Course Materials: MyMathLab and <i>Calculus and its Applications</i> , Bittinger	
Course: Calculus for Business	
Course Format: Hybrid: 50 percent lecture; 50 percent online	
Key Result Focus: Decrease class time; maintain course outcomes	
Key Feature: Prerequisites	
Conclusion and Resources	55
Ten Steps to a Successful Implementation	56

List of Contributors

Patty Bonesteel
Wayne State University, Detroit, MI

Joe Brenkert
Front Range Community College, Westminster, CO

Developmental Mathematics Team
Montana State University Billings, Billings, MT

Joseph Diaco
Camden County College, Blackwood, NJ

Kim Ghiselin
State College of Florida, Bradenton, FL

Diane Hollister
Reading Area Community College, Reading, PA

Matthew Hudock
St. Philip's College, San Antonio, TX

Darin Kapanjie
Temple University, Philadelphia, PA

Marianne Morea
SUNY College at Old Westbury, Old Westbury, NY

Delbert Spear
Ivy Tech Community College

Kathy Spradlin
Liberty University, Lynchburg, VA

Brad Stetson
Schoolcraft College, Livonia, MI

Susan Twigg
Wor-Wic Community College, Salisbury, MD

Efficacy Support—Partnering with Pearson

At Pearson, we believe that learning is a life-changing opportunity and that education should have a measurable impact on learners' lives. We not only hold ourselves accountable for the products we make, we also work closely with educators to learn from, document, and share their learner experiences and outcomes via implementation and results case studies.

What Are Implementation and Results Case Studies?

Implementation and results case studies share actual implementation practices and evaluate possible relationships between program implementation and student performance. The findings are not meant to imply causality or generalizability within or beyond these instances. Rather, they can begin to provide informed considerations for implementation and adaptation decisions in other user contexts. Mixed-methods designs are applied to all case studies, and the data collected include qualitative data from interviews, quantitative program usage analytics, and performance data. Open-ended interviews are used to guide data collection.

Why Is Pearson Interested in Case Studies?

Case studies have helped educators over the past decade understand more about the teaching and learning experience, and use data to inform implementation modifications to improve learner outcomes and determine what is most relevant about their implementation and results. This in turn helps us improve our products and enables us to share blueprints of best practices with other educators seeking new ways to increase student success and continuously improve.

Pearson Results Library

The Pearson Results Library is a comprehensive collection of evidence-based case studies. Each case study documents the impact of educator best practices and Pearson digital solutions on student learning. Visit the Results Library at www.pearsonmylabandmastering.com/results.

Are you being asked to report on learner outcomes? Implementing a redesign? Wondering what impact your Pearson digital solution is having on program goals? **Pearson wants to partner with you.** Your results—and the best practices you used to achieve them—can be helpful and inspiring to your peers.

Questions to Consider

- What issues and challenges are you trying to address?
- What quantifiable outcomes are you trying to achieve?
- How will you measure these outcomes?
- How will you implement your chosen Pearson digital product to generate results?

What Quantitative Results Can Be Measured?

We can help you gauge the impact that your implementation, taken holistically, is having on your students' learning and course success. The results you measure with the full support of our data analysts may include but are not limited to:

- Relationship between homework completion and scores and final exams (or final course grades)
- Comparison of test averages, pass rates, success rates, or retention rates over semesters
- Accelerated completion of remedial courses
- Completion and achievement in subsequent courses

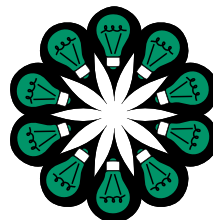
Don't Forget about Qualitative Observations

- Students coming to class more prepared and more engaged
- Improved class discussions; students asking higher-level questions
- Student ownership of learning, demonstration of agency and purpose in pursuit of academic goals

The Case Study Process—Partnering with Pearson

Every study project is unique. The process can take from two to nine months. Instructors interested in conducting studies should expect an interactive and rewarding partnership. To maintain objectivity, Pearson does not offer compensation for participation in case studies.

1. Overview call with Pearson efficacy results manager to discuss goals and research questions, identify measures of success, and agree on next steps.
2. Pearson provides planning guidelines, data collection tools, and sample surveys to share with students and faculty both at the start and end of your course.
3. Submission of quantitative and qualitative results and discussion of outcomes. Your Pearson efficacy results managers and data analysts are ready to assist with data analysis, to document implementation best practices, and to help define next steps.
4. Pearson completes the case study and sends it to the instructor for review and approval.
5. Pearson publishes the case study on its Results Library at www.pearsonmylabandmastering.com/results.



To learn more, contact your Pearson Efficacy Results Manager:

Candace Cooney, candace.cooney@pearson.com
Business, IT, Career, Technology, Nursing

Lauren Gill, lauren.gill@pearson.com
College and Career Readiness

Nicole Kunzmann, nicole.kunzmann@pearson.com
Humanities and Social Sciences

Mary Jo Lawless, maryjo.lawless@pearson.com
Developmental Math

Betsy Nixon, betsy.nixon@pearson.com
Science and Engineering

Sara Owen, sara.owen@pearson.com
English and World Languages

Traci Simons, traci.simons@pearson.com
Collegiate Math and Statistics

Product Name MyMathLab

Course Name Developmental Math sequence

Course Format Hybrid: Required four-hour, in-lab class + one hour each week required, mastery-based lab

Key Results Data from a developmental math redesign pilot indicates that the average rate of student progress in redesigned classes was nearly 40 percent higher than that in traditional classes.

Submitted by
Joe Brenkert, Faculty

Course materials
MyMathLab and *Developmental Math*, Squires and Wyrick

Setting

Front Range Community College is a two-year college serving more than 30,000 students a year from campuses in Brighton, Ft. Collins, Longmont, and Westminster. The largest community college in Colorado, it is the number one transfer institution for the University of Colorado-Boulder, Colorado State University, and Metropolitan State University of Denver.

Challenges and Goals

Neither instructors nor administrators were satisfied with the outcomes they were experiencing via traditional developmental course delivery methods. They chose to redesign in order to provide students with personalized learning experiences and the freedom to work at their own paces while also receiving more-frequent individualized feedback. Instructors and administrators both anticipated that as students felt more empowered, they would become more involved in their own learning and more successful overall.

Implementation

In spring 2013, Front Range's Brighton Center campus redesigned campus redesigned a two-semester developmental math sequence into one developmental course such that students meet in a computer lab on regularly scheduled days, they attend additional required lab hours, and content is delivered primarily via MyMathLab.

Students spend the majority of class time working independently on content modules in MyMathLab. Students from all levels of the developmental math sequence work in the same room with an instructor present.

Students begin each module with a pretest. If they don't pass the pretest, they must work through video tutorials, concept checks, and homework assignments before taking a posttest at the end of the module. Students' notes from the video tutorials are submitted and graded. These notes are checked by the instructor when a student has questions—if no notes are present or they are deemed insufficient, the student is required to watch the video again and take additional notes. Students must earn a score of at least 75 percent on concept checks and at least 80 percent on homework to move to the next topic. They are given unlimited attempts at homework and all learning aids are available.

Students must earn at least 75 percent on a proctored, password-protected module posttest to progress to the next module. Students who score less than 75 percent are required to remediate by working in the Study Plan, redoing homework, making test corrections, and meeting with an instructor before they can retake the posttest.

Students may accelerate at their own pace, which enables them to continue to the next sequence of modules during the same semester.

The redesigned classes had a significantly higher number of final course grades of A and B, and no Cs.

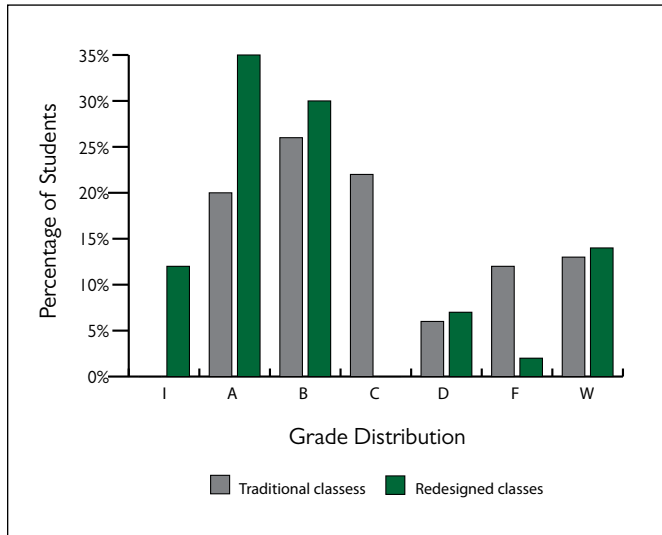


Figure 1. Comparison of Pass Rates from Traditional and Redesigned Courses, Spring 2013 (traditional, $n = 985$; redesign, $n = 43$)

Grade	Traditional Courses		Redesign Courses	
	Count	Percent	Count	Percent
I		0%	5	12%
S/A	199	20%	15	35%
S/B	256	26%	13	30%
S/C	214	22%		0%
U/D	62	6%	3	7%
U/F	123	12%	1	2%
W	131	13%	6	14%
TOTAL	985	100%	43	100%
Pass Rate	68%		65%	
Pass Rate w/ I	68%		77%	

Table 1. Comparison of Pass Rates from Traditional and Redesigned Courses, Spring 2013 (traditional, $n = 985$; redesign, $n = 43$)

Results and Data

Table 1 and Figure 1 show the pass rates in the redesigned and traditional, face-to-face courses (all other compressed prealgebra with basic math, introductory algebra, and intermediate algebra classes in Westminster and Brighton) during spring 2013.

Two things immediately emerged from the data:

1. By traditional pass-rate calculations, the redesign classes were slightly ahead of the control classes. Brenkert believes that while four percentage points (six percent) higher is not much, considering the ancillary benefits, the redesigned classes being at least even with the traditional classes is significant.
2. The redesigned classes had a higher number of final course grades of A and B, and no Cs. The developmental math redesign committee believe that this could either be evidence of greater retention of curriculum content or a further sign of the structural differences mentioned earlier.

However, traditional pass rates are a binary measure—either a student passes or they don't. Because the redesign students are able to work ahead and needn't start from the beginning if they need to retake the course, traditional pass rates do not accurately portray their performance. With the nuance of self-pacing added to the equation, the traditional pass rate calculation, while helpful, does not tell the entire story.

To more accurately compare student progress within each course type, an alternative metric—one that demonstrates average student progress—is needed. The average progression rate shows how much of a course an average student finished in a semester. In a traditional class, because passing students complete one full course and failing ones must start over (have completed zero courses), the progression rate will equal the pass rate. It will fluctuate between 0 (all students failing) and 1 (all students passing).

Although only 65 percent of students in the redesigned classes passed, students progressed on average through 95 percent of a course—illustrating the true advantage of redesign.

	Traditional Courses	Redesigned Courses
Average progression of students who did not pass	0.00	0.31
Average progression of students who passed or received an Incomplete	1.00	1.15
Overall average progression rate	0.68	0.95

Table 2. Progression Rates for Traditional and Redesigned Courses, Spring 2013 (traditional, $n = 985$; redesign, $n = 43$)

In the redesign courses, the progression rate captures the dynamic nature of self-pacing. Because the progression rate fluctuates based on both whether or not the student passed the course and how much of the course the student has passed, it more accurately demonstrates a student's progress. In addition, the progression rate portrays the benefits to the students who progressed into the next class.

Although 65 percent of students in the redesigned classes passed, students progressed on average through 95 percent of a course—illustrating the true advantage of redesign. The overall average progress in the redesign classes was nearly 40 percent higher than that in the traditional, control classes.

The Student Experience

Students in the redesign classes completed surveys at both the beginning and end of the semester. Following are observations taken from each. Scores are on a Likert-like point scale in which 1 = *very negative* and 5 = *very positive*.

Beginning of the semester

- One-third of the students knew about the difference in the structure of the course prior to registering.
- The average score concerning students' feelings about math was 3.2. The developmental math redesign committee believed that the population was neutral and not predisposed to like the course material.
- When asked what aspect of the course most excited them, 62 percent of the students referenced some aspect of individualized pacing.

End of the semester

- 91%** of respondents rated their experience in the class as either positive or very positive. The average score was over 4.5.
- 77%** of respondents reported that they received more support in the redesigned class than they have in traditional math classes.
- 77%** of respondents reported that they had more control over their learning in the redesigned class than they have in traditional math classes.

Selected comments

- "It was one of the most positive educational experiences I've ever had."
- "I would encourage anyone to take this class over a traditional math class."
- "I did more, the work helped me to be more knowledgeable, and it gave me a boost in confidence."
- "I feel as though I am good at math now."

Conclusion

Instructors classified their reflections on the first semester of this redesign into three categories: confirmations of expected results, unexpected revelations, and opportunities for future implementation.

Confirmations of expected results

Instructors believed that based on class performance and survey results, it appears that most students enjoyed and responded to scheduling their own pacing, a feature that more-dedicated students could truly take advantage of to move quickly through the curriculum. Pedagogically, the class structure effectively reinforced more procedural, skill-based learning. Students gained both more practice and more immediate feedback in the redesigned classes than in the more-traditional class structure. Finally, the redesigned courses made different demands on the instructors: class preparation shifted from lecture and presentation preparation to more-individualized review of student progress and preparation of tailored explanations, examples, and strategies.

Unexpected revelations

Instructors noted that the redesign structure—specifically, its lack of deadlines or traditional scheduling spaced evenly throughout the semester—could have resulted in significant procrastination. On the contrary, most students planned their own progress and effectively paced themselves. This additional challenge was a great opportunity for instructors to explicitly discuss student skills, such as time management, note taking, and test preparation; and for students to safely experiment with different ways to demonstrate their skills. By promoting individual conversations about these vital aspects of the learning process, the structure was credited with encouraging a level of metacognition that surpassed that of a traditional class structure.

Another unexpected benefit of the accelerated-pacing option was that students had complete control of their schedules. Six students completed at least two courses within one semester, and others finished one course before the semester ended, thereby freeing up time to focus on other classes or personal responsibilities outside of school. The committee believed that this kind of flexibility—a benefit not fully captured by the 40 percent progress rate—suggests that the redesign's ancillary benefits to students and instructors could actually be greater.

By increasing the amount of teacher-to-student interaction, the redesigned courses shift the relationships between instructors and students and, in many cases, helps students bond with their instructors. Word of these bonds has grown and despite the addition of another redesigned class, there is still a wait list for the fall semester.

Opportunities for future implementation

The committee maintained that the modular structure of this redesign could benefit certain degree programs. Programs could require students to know certain modules pertaining to relevant concepts, rather than entire courses that may include superfluous math concepts and present an impediment to completion.

This modular structure could be used, with slight adjustments, in the Colorado Community College System's developmental math curriculum. Modules could be rearranged to match learning objectives and seamlessly integrate into new developmental math courses. More structural changes would be needed to meet the corequisite and assessment preparation pieces of the new curriculum.

Finally, with an eye toward continually improving the redesign's structure, instructors are working on additional resources to supplement the online curriculum. These resources are intended to offer a broad, more-connected view of mathematical concepts.

Front Range's developmental math instructors are looking toward dramatic curriculum changes in 2015. The lessons learned during this redesign will directly inform their decisions about how to best motivate student success.

Product Name **MyMathLab**

Course Name **Intermediate Algebra**

Course Format **Face-to-face**

Key Results After implementing Personalized Homework in MyMathLab in a face-to-face Intermediate Algebra course, final exam scores were an average of 7.6 percentage points over the institutional average in face-to-face Intermediate Algebra courses.

Submitted by

Brad Stetson, Assistant Professor

Course materials

MyMathLab and *Beginning & Intermediate Algebra*, Martin-Gay

Setting

Schoolcraft is a comprehensive, open door, community-based college focused on innovation and academic success. The mission of the College is “to provide a transformational learning experience designed to increase the capacity of individuals and groups to achieve intellectual, social, and economic goals.”

According to the college’s website, on average, over the past four years:

- Forty-three percent of Schoolcraft students transferred to another college within three years.
- Eighteen percent of Schoolcraft students graduated within three years.

Challenges and Goals

Brad Stetson, assistant professor and intermediate algebra instructor, noticed that he was spending a lot of class time reviewing homework problems and writing example problems on the board. As a result, he was unable to move through the topics as quickly as needed, and he felt that his students still did not understand the concepts as well as they should. Stetson hypothesized that adding personalized homework to his curriculum would have a positive impact on final exam scores.

Implementation

Stetson’s Intermediate Algebra course meets two or four times per week, depending on the section, and includes students from almost all majors. During class meetings, Stetson lectures on the topic at hand and students work in groups of four to complete worksheets that cover the objectives that will be assessed on the exam. Stetson grades and returns these worksheets in class. Students then independently complete homework in MyMathLab outside of class.

Stetson strongly believes in “practice, practice, practice,” so his MyMathLab course heavily focuses on mastery. On homework assignments in MyMathLab, Stetson allows students three attempts on a problem. They may then click “similar exercise” if they want to continue working on a particular type of question. At the end of each chapter, Stetson assigns a practice test in MyMathLab. Students are allowed unlimited attempts; then, when they finish, a personalized homework assignment populates based on their practice test results. Students can earn extra credit for the work they do in the personalized homework assignment.

To set up the practice test and subsequent personalized homework assignment, Stetson looks at the objectives he plans to cover on the exam and uses a pool of questions relating to those objectives. The personalized homework includes six questions pertaining to the objective or objectives the student didn’t master.

Assessments

56.1 percent Unit exams (six exams at 100 points each)

18.7 percent Final exam (common departmental final)

14.0 percent MyMathLab homework

11.2 percent Group worksheets

≤ 4.5 percent Extra credit MyMathLab personalized homework

“I get to work with students more and actually teach in class, rather than simply writing down problems and grading.”

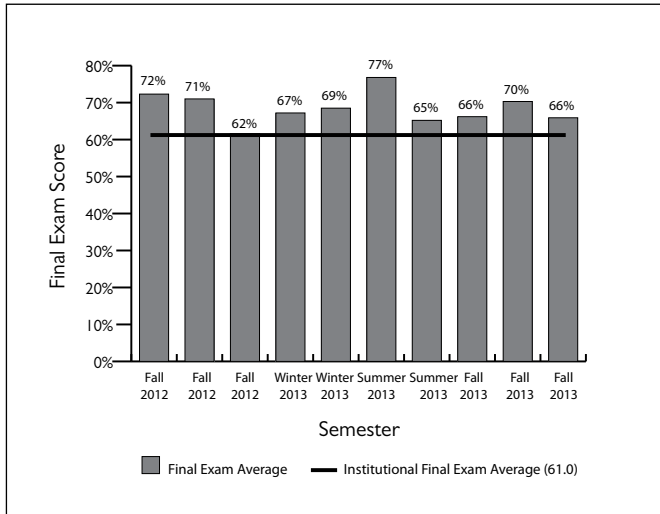


Figure 1. Comparison of Stetson's and Institutional Average Final Exam Scores, Fall 2012–Fall 2013 (Fall 2012, $n = 39$; Fall 2012, $n = 41$; Fall 2012, $n = 120$; Winter 2013, $n = 25$; Winter 2013, $n = 27$; Summer 2013, $n = 11$; Summer 2013, $n = 13$; Fall 2013, $n = 39$; Fall 2013, $n = 40$; Fall 2013, $n = 112$)

Results and Data

As indicated in Figure 1, the average scores on the common final exam for Stetson's classes, which had personalized homework assignments prior to exams, are significantly higher than the institutional average ($t(9) = 5.5, p < .001$). On average, Stetson's Intermediate Algebra classes outperformed the institutional average by 7.5 points on the common final exam. Further research is needed to investigate the relationship, if any, between the implementation of personalized homework and student performance.

The Student Experience

Stetson maintains that students appreciate the use of MyMathLab in the course. Stetson remembers passing back the sixth exam during the winter semester of 2013, when one of his students commented, "I've never gotten a single good grade on a math exam before this class, let alone an A on every test. I'm never taking another math class again unless it uses MyMathLab." His exam scores, according to Stetson, were: 94, 90, 97, 92, 99, and 100.

Conclusion

Because he doesn't have to cover as many minute details as he did prior to using MyMathLab, Stetson has more available class time, which he believes allows for more flexibility in his teaching. "I know and rest assured that if students don't understand a concept or a homework question, they can use the View an Example feature in MyMathLab." He also encourages students to utilize the Ask My Instructor feature so that he can answer homework questions on the go, rather than have students wait and use up valuable class time with questions about the homework. Stetson now uses that valuable class time to cover questions that multiple students had difficulties with; occasionally he even writes the solutions out ahead of time so that students can see them as soon as they come into class. "I get to work with students more and actually teach in class, rather than simply writing down problems and grading," says Stetson. "I even have time in class to do extra activities—imagine that!"

Product Name **MyMathLab**

Course Name **Elementary Algebra**

Course Format **Fully online**

Key Results After implementing MyMathLab plus its accompanying Video Organizer in a fully online, self-paced Elementary Algebra course, student pass rates increased by 40 percent.

Submitted by

Kim Ghiselin, Assistant Professor

Course materials

MyMathLab and *Preadgebra & Introductory Algebra*, Elayn Martin-Gay plus Video Organizer

Setting

Established in 1957, State College of Florida, Manatee-Sarasota (SCF) is the region's first and largest public, two-year college serving approximately 27,000 college-credit students a year via three campuses and online. For the 2013/14 academic year, 53 percent of the school's full-time students received Pell Grants. In fall 2013, 60 percent of its students were female, 58 percent were enrolled part-time, 66 percent identified themselves as Caucasian, and 14 percent identified themselves as Hispanic.

The Elementary Algebra course comprises basic algebra concepts and skills needed for success in higher-level courses. Topics include working with real numbers, exponents, polynomials, radicals, rational expressions, graphing linear equations, factoring polynomials and solving linear and quadratic equations. In Assistant Professor Kim Ghiselin's online course, students submit online assignments, work outside of the classroom to complete course material, and come to campus or other approved testing center to take proctored, paper-and-pencil exams.

Ghiselin employs MyMathLab and the accompanying Video Organizer to fulfill her goal of providing an eight-week, self-paced, accelerated course in which students can get up-to-speed in developmental math and be prepared to proceed to college-credit courses.

Challenges and Goals

In fall 2014, the Florida legislature mandated that students who graduated after 2007 from a Florida public high school needn't take placement tests, can skip developmental math, and can enroll directly into college-level math courses. As a result, some students entering college math courses are not ready for college-level content. In addition, because the State's goal is to move students more quickly through the developmental math sequence, developmental math courses must now be taught in 8-week sessions instead of the traditional 16-weeks. According to the SCF website, of the 2011/12 Florida public high-school graduates who enrolled in fall 2012, only 59.4 percent were ready for college-level mathematics.

Ghiselin employs MyMathLab and the accompanying Video Organizer to fulfill her goal of providing an eight-week, self-paced, accelerated course in which students can get up-to-speed in developmental math and be prepared to proceed to college-credit courses.

Content in the Video Organizer is presented in the same order as it is presented in the videos, making it easy for students to create a course notebook and build good study habits.

Implementation

The online course meets three times per term: for a course orientation at the beginning of the semester, a proctored midterm, and a proctored final exam. In accordance with US Department of Education guidelines regarding class participation, during the first four calendar days of class the school requires students to complete an orientation and then submit any required first-half of Week 1 assignments for each course. Financial aid cannot be released without class participation as defined above, so Ghiselin requires that her students complete a MyMathLab Orientation assignment, a Diagnostic Test, a homework assignment and Video Organizer, and the first part of discussion post #1 by the fourth day of the semester. Students who don't comply are dropped from the course and classified as no shows.

Every week, sections are assigned according to the syllabus calendar. For each assigned section, students are asked to do the following.

1. **Read the section in the eText.**
2. **Watch the Lecture Videos for the section in MyMathLab and complete the Video Organizer.** The Video Organizer, created by the textbook author, Elayn Martin-Gay, encourages students to take notes and work practice exercises while watching the author's lecture series. Content in the Video Organizer is presented in the same order as it is presented in the videos, in an effort to make it easier for students to create a course notebook and build good study habits. In addition, the Video Organizer provides ample space for students to write key definitions and rules throughout the lectures, and *play* and *pause* icons prompt students to work exercises both with Martin-Gay and on their own. Students submit their Video Organizers for grading during paper-and-pencil midterm and final exams.
3. **Complete the homework in MyMathLab.** Weekly homework assignments are due on Wednesday and Sunday nights. Students have unlimited attempts to complete approximately 20 questions.
4. **Complete the discussion assignment.** Students are required to answer the posted discussion question and respond to at least one classmate. Example questions

include: discuss how you plan to study for the course, give a real-life example of slope, and give a trinomial that can be factored into two or three factors (someone else in the class provides the answer). Ghiselin conducts these discussions via Canvas.

Students take five chapter tests (including a proctored midterm) and a proctored final exam. Learning aids are turned off during MyMathLab chapter tests and students have one attempt and 60 minutes to complete each one. However, students who have scored at least 80 percent on all unit assignments earn a second test attempt. Ghiselin emphasizes that students return to MyMathLab Study Plans to review for their second attempts.

In addition to MyMathLab's lecture videos, homework, and testing capabilities, Ghiselin uses the item analysis feature in the program's gradebook to see what test items students are missing. She then checks their second attempts in the same way. Students must score at least 70 percent on the final exam in order to pass the course.

Assessments

50 percent	Chapter tests <i>(four online via MyMathLab; one proctored, paper and pencil)</i>
20 percent	Comprehensive final exam <i>(paper and pencil, proctored, must score at least 70 percent to pass the course)</i>
10 percent	Discussion assignments
10 percent	MyMathLab homework
10 percent	Video Organizer

Results and Data

Ghiselin believes that the Video Organizer made a positive difference in her online courses. In fall 2014, she offered two eight-week sessions of the course. In the first session, 19 of 24 students completed the Video Organizer to at least 90 percent. Of those 19 students, 84.2 percent (16) earned an A, B, or C in the course, which allowed them to proceed to college-level courses. The three students who did not pass the course received Ds because they scored less than 70 percent on their

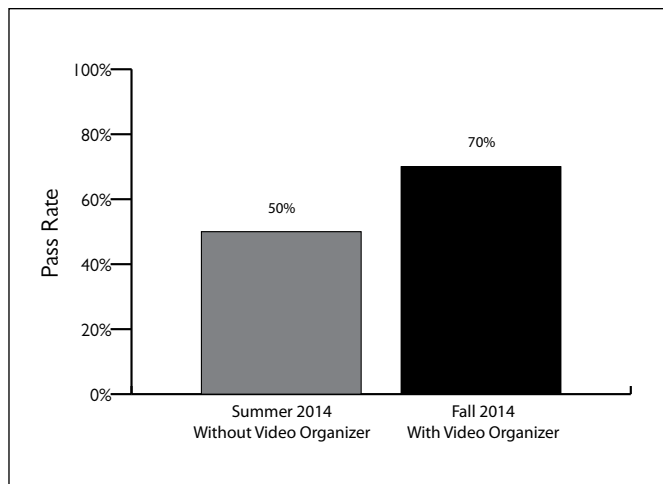


Figure 1. Pass Rates before and after Implementation of the Video Organizer, Summer 2014 ($n = 37$) and Fall 2014 ($n = 43$)

final exams. Three of the five students who failed to complete the Video Organizer received Fs in the course.

In the second eight-week session, four of the nineteen total students did not submit Video Organizers at midterm. Five (including the four who didn't submit Video Organizers) received Fs in the course, resulting in a 73.7 percent pass rate. The student who did turn in the Video Organizer but did not pass the course performed poorly on the final exam.

Since implementation of the Video Organizer, pass rates have increased by 40 percent—from an average of 50 percent during three eight-week terms prior to implementation to an average of 70 percent with it (Figure 1). The data indicate a relationship between Pass Rates and Video Organizer implementation. Video Organizer completion represented 10 percent of the final course grade when calculated, thereby influencing this relationship. Ghiselin, though, attributes the increase to students being engaged in course content, working problems while watching the videos, and taking notes in a more organized manner—all of which are enabled by the Video Organizer.

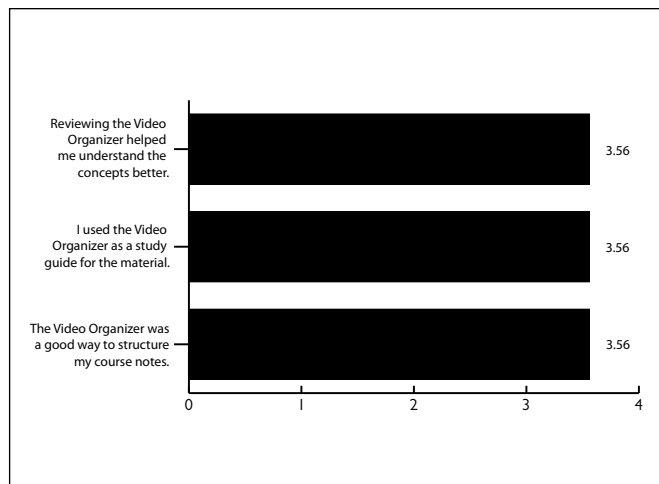


Figure 2. Student Survey Responses, Spring 2015 ($n = 9$)

The Student Experience

Students who completed a fall 2014 survey were complimentary about the resource's impact on their learning. Comments included the following:

"The Video Organizer was essential to pulling together the lessons we were learning. Simply reading how to solve the problem was not enough for me. The video lessons were essential."

"I used the Video Organizer two to four times a week. It was a graded assignment, but it's also how I received all of my lectures for the course. They were super easy to follow and made keeping up in class simple."

Figure 2 shows student responses from a spring 2015 survey. [Note: Ghiselin cautioned that survey participation was low because it was given on the last day of class *after* the final exam.]

Conclusion

"I recommend that anyone teaching this course online consider requiring the Video Organizer," says Ghiselin. "My results reflect the truth behind the phrase 'students don't do optional.' The videos are short and help my students save time—they no longer spend hours trying to take short cuts or going straight to assigned problems without first having some instruction. I also receive fewer emails for help because Martin-Gay's videos addressed most of my students' questions."

Product Name MyLabsPlus

Course Names Prealgebra, Elementary Algebra, Intermediate Algebra

Course Format Emporium

Key Results Redesigned developmental courses that included MyLabsPlus-supported emporium models resulted in both an 18.4 percent increase in pass rates and increases in learning gains.

Submitted by

Susan Twigg, Developmental Math Coordinator

Course materials

MyLabsPlus and *Developmental Mathematics Series*, Martin-Gay

Setting

Wor-Wic Community College is a public, two-year college serving the residents of Worcester, Wicomico, and Somerset counties of Maryland. An open-enrollment institution, the fall 2013 student profile shows that most students (68 percent) enroll part-time.

Challenges and Goals

Historically, Wor-Wic Community College's developmental math pass rates averaged 84.7 percent, and the retention rate averaged 71.6 percent. Wor-Wic had been teaching traditional face-to-face courses with MyMathLab as a supplement that students used to do their homework. First, the school switched to a modified emporium model where students were in the classroom three hours per week with a mini lecture at the beginning of each class. Now, in the final iteration of their redesign, MyLabsPlus delivers the total course.

Implementation

Wor-Wic started its pilot, the modified emporium method, in fall 2012 and began full implementation in spring 2013. The redesigned course has deadlines but is structured so that students can make their own decisions throughout the course. Prealgebra and Elementary Algebra students begin each section by watching a slide show about the objective. They must then decide if they know the information well enough to take the pretest. If students take the pretest and score 100 percent, they are finished with the section and can move on to the next one. However, if they do not score 100 percent on the pretest, or choose not to take it because they aren't comfortable with the material, they must work through the content. This can include watching a video, reading the textbook, taking notes in their notebook (Table 1), and doing the section homework at a minimum of 85 percent. At that point, they can move on to the next section's slide show and do the cycle again. Once each section is completed, students take a test inside MyLabsPlus.

Wor-Wic also developed a flow chart to aid students in their decision-making and to help them know where to go next in the course. The chart suggests next steps based on the decisions they made prior.

Wor-Wic's Intermediate Algebra course is structured the same way, except that students do not take a pretest. Instead, they take a quiz after every three or four sections and a test at the end of the chapter. Students are allowed three attempts at the quiz without the help of learning aids.

Assessments

35 percent	MyLabsPlus tests (proctored)
35 percent	Homework (MyLabsPlus and student notebook)
20 percent	MyLabsPlus final exam (proctored)
10 percent	Progress/attendance (Students earn points for progress in the course, not just attendance; Table 2)

Points Possible	Guidelines for Notes	Guidelines for Practice Problems
4–5	Notes are complete	All work is shown
2–3	Notes are lacking information	Some work is shown
0–1	No notes	No work is shown

Table 1. Student Notebook Grading Guidelines

Points Possible	Guidelines
3–4	Meeting progress goals
1–2	Working toward progress goals
0	No progress toward goals

Table 2. Progress/Attendance Grading Guidelines

Results and Data

At the start of their redesign, Wor-Wic established the following objectives they needed to meet in order to consider the redesign a success: increase pass rates, increase retention rates, increase pass rates for first-time attempters, improve mastery of content, and increase final exam scores by various percentage points according to the course.

The redesigned courses realized gains in pass rates compared to the traditionally taught sections, which had averaged 84.7 percent (87.35 percent for Prealgebra, 83.35 percent for Elementary Algebra, and 83.2 percent for Intermediate Algebra; Figure 1). Pass rates climbed, for all developmental classes combined, from 77.3 percent in the fall 2012 traditional courses to 91.5 percent in spring 2013’s fully implemented redesigned course, an 18.4 percent increase.

In addition, the retention rate averaged 71.6 percent across all developmental math courses (Prealgebra: 70.8, Elementary Algebra: 71.0, Intermediate Algebra: 73.1; Figure 2).

For their Prealgebra course, Wor-Wic met its goal by increasing pass rates by 7.8 percentage points and final exam pass rates by 10 percentage points, and they were just shy of meeting their learning gain goal with an increase of 6.2 percentage points (Figure 4).

In Elementary Algebra, Wor-Wic met its goal for four out of five success factors: increasing pass rates by 10 percentage points, first attempt pass rates by 5 percentage points, learning gains by 11 percentage points, and final exam pass rates by 15 percentage points (Figure 5).

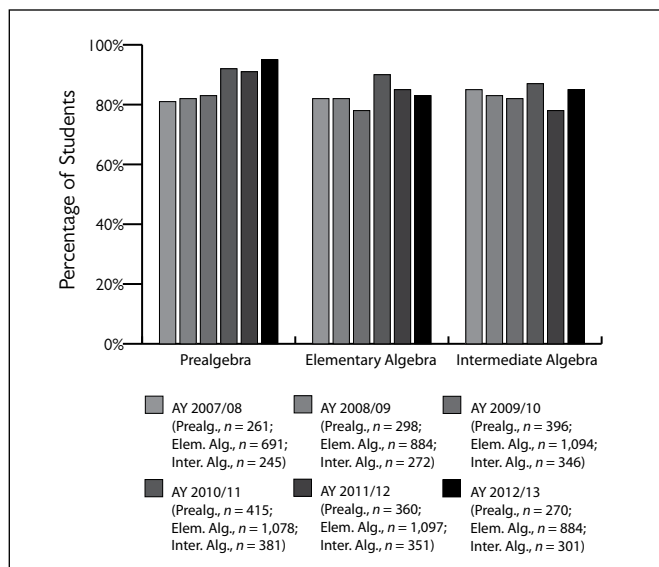


Figure 1. Developmental Math Pass Rates, Fall 2007–Spring 2013

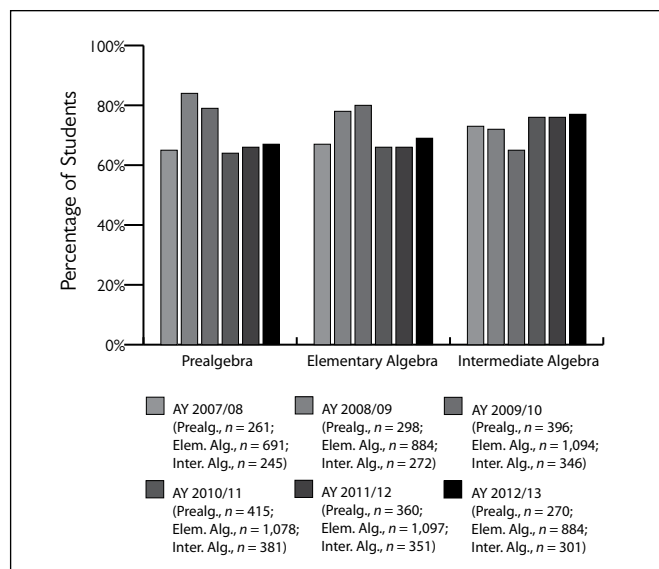


Figure 2. Developmental Math Retention Rates, Fall 2007–Spring 2013

In its Intermediate Algebra course, Wor-Wic saw an increase in pass rates of 3.3 points, grew retention rates by 4.1 percentage points, and increased and first attempt pass rates by nine percentage points; learning gain and final exam pass rate data was unavailable. (Figure 6). In addition, the average redesigned course pretest-to-posttest score increase was 57.4 percentage points—from 6.8 percent on the pretest to an impressive 64.2 on the posttest.

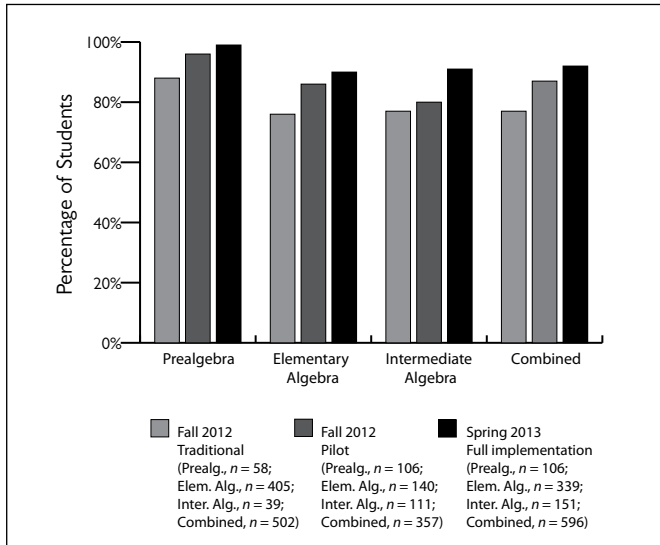


Figure 3. Developmental Math Pass Rates of Students Retained During Redesign, Fall 2012–Spring 2013

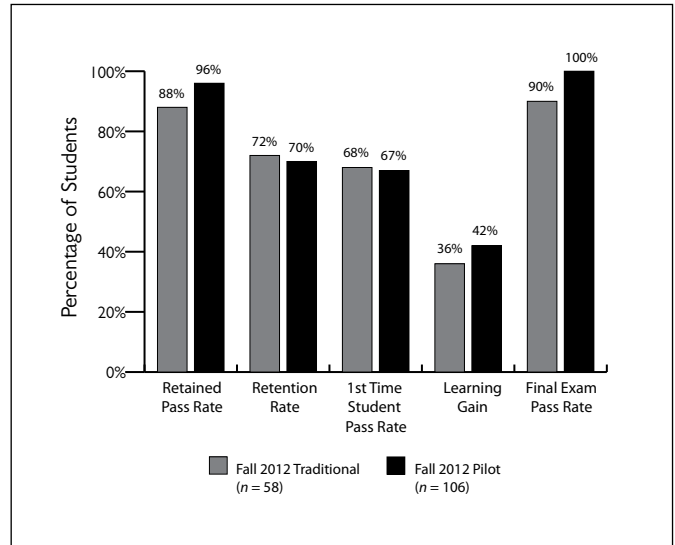


Figure 4. Prealgebra Redesign Success Factors, Fall 2012

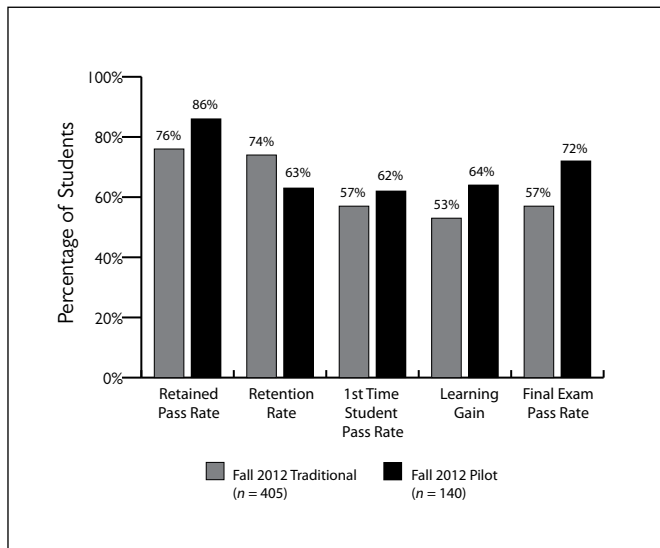


Figure 5. Elementary Algebra Redesign Success Factors, Fall 2012

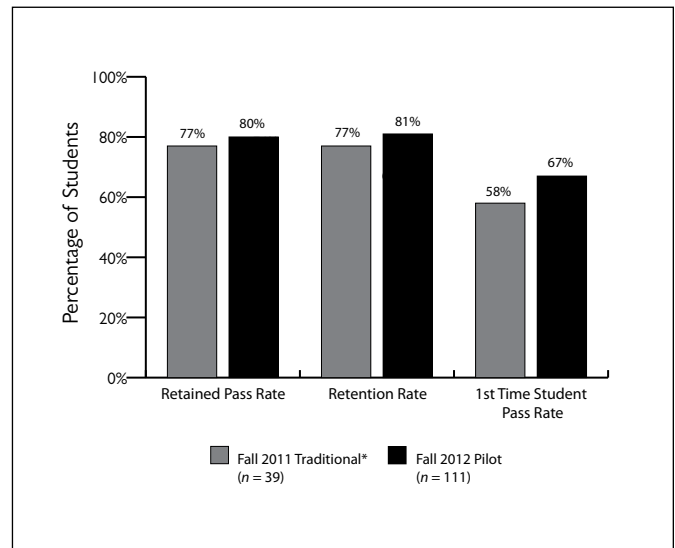


Figure 6. Intermediate Algebra Redesign Success Factors, Fall 2011 and Fall 2012
*Fall 2011 data was used because fall 2012 traditional classes were cancelled.

The Student Experience

According to Susan Twigg, developmental math coordinator, “Students’ attitudes about doing math is more positive since we began the redesign. They come to class early and begin completing their work right away. They are more excited about moving through the developmental series than I ever saw them in the traditional class because they know they can move quickly through the concepts they have mastered and slow down in their particular area of difficulty. MyLabsPlus is a large part of making this possible. The teaching aids in MyLabsPlus make

it possible for each student to work at a different place in the material.”

In a faculty-designed survey, students were asked which format they would prefer if given the choice between the new format and the traditional classroom lecture format. In her analysis of student responses, Twigg determined that most students chose the new format. Twigg highlighted the following two responses:

- “I would choose the new format because it’s easier to stay up to date with the class if you are a busy person.”

“Redesign has been a move in the right direction for our school. The students are happier and work better, and MyLabsPlus frees the teachers to work individually with the students.”

- “For this course...I would choose this new format because it allows you to work on the problems at your own speed, and if you need help understanding a concept, you still always have a teacher in the room to help you.”

In addition, Twigg’s findings included that the majority of students surveyed appreciated the fact that they could move at their own pace, yet still had an instructor who could help them if they got lost. Based on the experiences and data collected, Twigg believes that the flexibility built into the course, along with the comfort of having an instructor in the lab at all times, was a determining factor in student satisfaction with the course.

- “When I walked into the classroom and saw the computers, I was very intimidated. As an older student, I was not used to doing my math on the computer. Now, at the end of the class, I feel very comfortable with the format and loved the class. I would recommend it to others.”

Conclusion

While Wor-Wic Community College saw an increase in pass rates, first-attempter pass rates, learning gains, and final exam pass rates, they haven’t yet been able to consistently increase their retention rates. To help with this, coordinators are talking to instructors about being more of a mentor to students throughout the course. The school feels that if students receive more career advice, lines of communication are more open, and there is even more personal contact, the retention rates will rise.

To identify who needs intervention, instructors consult the MyLabsPlus gradebook for the amount of time spent on each section by each student. If a student has spent three or more hours on a section, the instructors reach out and suggest that the student go for tutoring in the math lab.

Perhaps more encouraging for Wor-Wic is the fact that they had good results and realized increases despite the fact that they found teachers had previously been choosing not to teach certain topics, such as word problems, and now, in the rede-

signed course, there is no flexibility in what to teach, so every student is being held accountable to the same standards.

In addition, the school has learned how important instructor training is. “We thought we had trained all our instructors, but we still get questions or see instructors doing things in an unusual way. We need to make sure we train all of our instructors thoroughly not only in MyLabsPlus but also in teaching in the redesigned classroom.”

Twigg is happy with the results: “Redesign has been a move in the right direction for our school. The students are happier and work better, and MyLabsPlus frees the teacher to work individually with each student. I feel like I have more one-on-one contact with my students and get to know them and their strengths and weaknesses more than in a traditional classroom. Redesign has revitalized my teaching and made me excited to go to class each day.”

Product Name MyLabsPlus

Course Name Fundamentals of Mathematics and Intermediate Algebra

Course Format Emporium: both open and scheduled lab; flexible pacing

Key Results After redesigning its developmental math sequence from traditional, face-to-face courses to an emporium model using MyLabsPlus and requiring topic mastery and scheduled lab hours, Liberty University saw ABC rates increase by as much as 22 percent.

Submitted by

Kathy Spradlin, Coordinator of Math Emporium and Developmental Math

Course materials

MyLabsPlus and *Developmental Mathematics* (custom for Liberty University), Squires and Wyrick

Setting

Liberty University, founded in 1971, is the largest private, non-profit university in the nation, the largest university in Virginia, and the largest Christian university in the world. Located near the Blue Ridge Mountains on more than 7,000 acres in Lynchburg, Virginia, Liberty offers more than 450 unique programs of study from the associate to the doctoral level. More than 200 programs are offered online. Liberty's mission is to train Champions for Christ with the values, knowledge, and skills essential for impacting tomorrow's world.

Challenges and Goals

Liberty University began using technology in their math courses in 2004 but had never used MyMathLab. Due to limitations with their program, they had to evaluate new options to accommodate their emporium redesign. MyLabsPlus was selected as a "superior product" for implementing their new format. After initial implementation, the department made adjustments to the program to improve course outcomes. They hypothesized that allowing late work to be turned in, with a penalty, and requiring lab hours would improve student performance.

Implementation

MyLabsPlus was implemented in spring 2012 in all sections of Fundamentals of Mathematics and Intermediate Algebra. Students spend one hour each week in a lecture format class and at least three additional hours in the Math Emporium, a computer lab with 250 computers that is open about 75 hours

per week. In spring 2012, students could choose when to work in the lab. In fall 2012, the school began to schedule a portion of the required lab hours. Tutors and faculty are available in the math lab for personalized instruction, assistance with homework, and review of quizzes and tests.

MyLabsPlus is used to create and complete homework assignments, quizzes, proctored tests, and the final exam. In addition, it is used as a platform to deliver instruction, making use of the video lessons included with the textbook and additional custom videos uploaded by the instructors. Questions on all assignments are drawn from MyMathLab's bank of problems or created using MyMathLab's custom exercise builder. Personalized assignments are created using the option to omit questions from objectives that were mastered on a previous assignment. Students are encouraged to use the Gradebook to review what they have missed on their quizzes before making additional attempts.

Students may complete MyMathLab homework from any location. They have unlimited attempts to achieve at least 80 percent mastery, and all learning aids are available. Homework can be completed after the due date; however, a five percent penalty is applied by MyLabsPlus.

Students take 11 quizzes, one at the end of each unit. They have three attempts to achieve 80 percent mastery. The highest score counts toward the course grade. Students who do not achieve mastery are required to meet with a tutor to review their quizzes before another attempt is granted. A homework grade may be deleted when a student is required to redo an assignment.

Students take three proctored tests and a final exam in the Math Emporium using MyLabsPlus. Tests have passwords and time limits. If students don't achieve at least 70 percent on a test, they must complete a personalized homework assignment based on that test (meeting the 70 percent mastery) before a second attempt at the test is open to them. If they are unable

The fall 2012 ABC rates rose by 22 percent in Fundamentals of Math and 14.7 percent in Intermediate Algebra, compared with average ABC rates prior to MyLabsPlus usage.

to reach 70 percent on their second attempt, the student must meet with their instructor to discuss strategies to improve their mastery.

The developmental math courses are flexibly paced, meaning that students who do not complete the course in one semester can start the following semester with the unit after the last test they passed, instead of starting at the beginning. In addition, students are allowed to work faster than the schedule and complete the course early. Fundamentals of Mathematics students who complete the course in less than eight weeks may start Intermediate Algebra during the same semester. Students who complete Intermediate Algebra in less than four weeks can start their next course in Liberal Arts Math or Statistics.

Assessments

Fundamentals of Mathematics

45.0 percent	MyLabsPlus tests (three, proctored, timed, password protected)
19.4 percent	MyLabsPlus final exam (proctored, timed, password protected)
15.3 percent	MyLabsPlus homework (unlimited attempts, 80 percent mastery required)
11.0 percent	MyLabsPlus quizzes (three attempts, 80 percent mastery required)
9.3 percent	Participation

Intermediate Algebra

49.5 percent	MyLabsPlus tests (proctored, timed, password protected)
20.7 percent	MyLabsPlus final exam (proctored, timed, password protected)
14.1 percent	MyLabsPlus homework (unlimited attempts, 80 percent mastery required)
7.7 percent	MyLabsPlus quizzes (three attempts, 80 percent mastery required)
8.0 percent	Participation

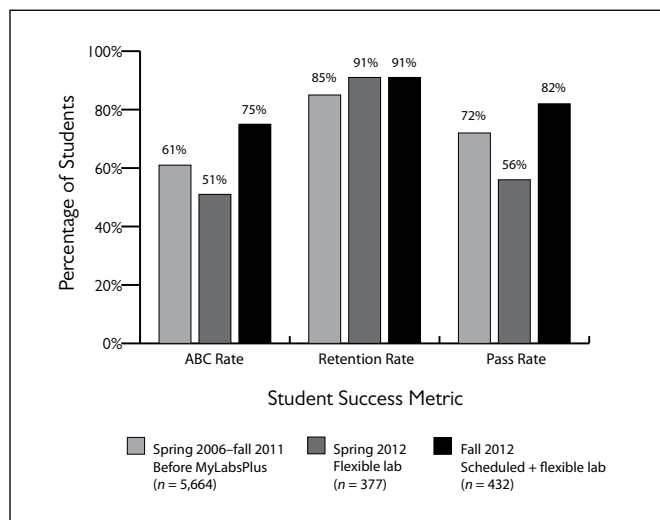


Figure 1. Student Success Rates in Fundamentals of Math before and after MyLabsPlus Implementation, Spring 2006–Fall 2012

Results and Data

The fall 2012 ABC rates increased by 14 percentage points (22 percent) in Fundamentals of Math and nine percentage points (14.7 percent) in Intermediate Algebra, compared with average ABC rates prior to MyLabsPlus usage (Figures 1 and 2). In addition, pass rates based on the number of students completing the course rose 10 percentage points (13.3 percent) in Fundamentals of Math and 12 percentage points (15.7 percent) in Intermediate Algebra, compared to pass rates in the 12 semesters prior to MyLabsPlus usage. Success was not achieved without effort, however.

The first semester MyLabsPlus was used, completion rates fell below 60 percent. At that time, mastery requirements applied to homework and quizzes only, and the course had firm deadlines. The department found that many students were not managing their time well and were doing assignments late or not at all, thereby preventing them from opening the unit quiz and, ultimately, making them ill prepared for their test. As a result, the department made some modifications to their redesign:

- Students can complete assignments after due dates with penalties.

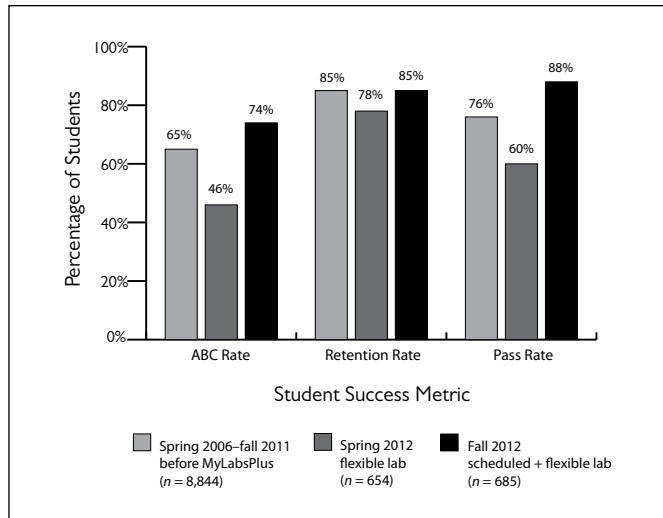


Figure 2. Student Success Rates in Intermediate Algebra before and after MyLabsPlus Implementation, Spring 2006–Fall 2012

- Mastery requirements are strictly enforced.
- Some Emporium hours are scheduled to help students manage their time.

In the fall of 2012, the developmental math coordinator, who manages the delivery of course objectives across 50 sections per semester, began to retrieve course data using the Advanced Export feature in MyLabsPlus. An Excel spreadsheet is used to analyze the following: grades by instructor, grades by days of the week, mean test score, mean course grade, number enrolled, number who had not taken the test, and average time spent on the test.

According to Kathy Spradlin, developmental math coordinator, analysis of the data concludes that a student's grade does not depend on the day of the week his class meets or his instructor, but it does suggest that students may not spend sufficient time on tests. Evaluation of course data has allowed for ongoing adjustments and improvements. Faculty took note of how many students across all sections had not taken a test on time, and planned interventions to help students work harder and smarter. In addition, armed with data showing which topics took students more time to learn, some lessons have been reorganized and others more thoroughly covered in class.

The Student Experience

Intervention strategies

The department utilizes the "email by criteria" option in MyMathLab to communicate with students who are not completing assignments in a timely manner. In addition, faculty meets with the students and refers them to the university's retention coordinator when necessary. The department also requires each student to complete every assignment with 80 percent mastery before moving on, plus offers one-on-one tutoring. One student reports success as follows:

- "Math is the one subject that I have always been poor at. The way MyLabsPlus was structured pushed me to do my very best and to master each subject. The Help Me Solve This option for each problem is what I have needed throughout all of the math courses that I have taken in my life. I need to be shown step-by-step how to solve each problem that I had. Once I was able to see and work through each step, I could click 'Similar Exercise' and do the problem myself successfully."

"The way MyLabsPlus was structured pushed me to do my very best and to master each subject."

–Student

Increased communication and collaboration

Prior to implementing the emporium model, communication between instructors and students primarily comprised the instructor speaking to the entire class and to the few students who sought help during office hours. In the MyLabsPlus courses, there is increased communication with individual students as instructors provide personalized instruction and review the results of quizzes and tests. Peer tutors assist students with homework problems and explain concepts. Student comments reflect their preference for the new program's flexibility and individualized instruction:

- "I like that we don't have to sit in a classroom three days a week working at the same pace as everyone else, but that we can work as far ahead as we want. The opportunity to be able to finish before the end of the semester is a nice change."

- “I enjoy that if I know the material I can advance, and if I am struggling with a particular area I can spend a little more time on it and not worry about the rest of the class moving on.”
- “Having instructors in the Emporium available when the computer-guided material lost me was excellent.”

Student learning strategies

Having unlimited attempts on homework assignments allows students as much practice as they need to master a concept. Having three attempts on each quiz, followed by a conference with a tutor (if necessary), ensures that students review the concepts that they did not master. Many students indicate an appreciation for this strategy:

- “I really love that everything was done by computer. I have never done that kind of thing before, and math is my worst subject, but for some reason I loved this class. It made learning math so much easier for me.”
- “I like that I can retry a problem over and over if I miss it the first time.”

Conclusion

Overall, Spradlin reports that students are spending more time doing math and less time watching someone else do math. She believes that because mastery is required, students are getting a solid foundation in all concepts; whereas, in traditional courses, a student could pass with high grades on a few chapters and failing grades on others. The department plans to begin offering unit pretests to help students who know the material move ahead more quickly.

Spradlin says she would suggest MyLabsPlus to a colleague with the warning that merely adding computer homework onto traditional instruction is not the best use of an online learning system. “The course should be redesigned with a balance of online learning and human interaction.”

Product Name MyMathLab

Course Name Introductory and Intermediate Algebra

Course Format Face-to-face

Key Results

When controlled for pre-COMPASS scores, students who participate in a modularized, combined Introductory and Intermediate Algebra course perform significantly better in subsequent courses of College Algebra (eight percent higher) and Finite Math (seven percent higher) than students who take the traditional two-semester Introductory Algebra and Intermediate Algebra sequence.

Submitted by

Developmental Mathematics Team

Course materials

MyMathLab and *Elementary and Intermediate Algebra*, Carson and Jordan

Setting

Montana State University Billings, one of six universities in the Montana State University System, is located in downtown Billings. The majority of the school's nearly 5,000 students attend full time; 82 percent are Caucasian and 86 percent are from Montana. The school has an open access policy¹ and a student-to-faculty ratio of 19:1.

The combined Introductory and Intermediate Algebra course covers basic algebra concepts, including terminology, operations on rational numbers, linear equations and inequalities in one and two variables, equations of lines, polynomial and function operations, operations on exponential and radical expressions, factoring, rational/absolute value/radical and systems of equations, and quadratic equations. Students who score between 16 and 50 on their COMPASS tests are eligible for the course, which is modularized and based on a mastery learning system whereby students earn credit for each of four learning modules by examination (A, B, C, D), plus a fifth course final module (E). Students meet in a classroom for lecture five times per week, and each module is taught in a separate classroom. MyMathLab is assigned as outside homework.

Challenges and Goals

In about 2008, mathematics faculty noticed an increase in the number of developmental math students entering Intermediate Algebra with noticeable knowledge gaps—many students were forced to repeat the entire course despite having passed a part of it. They explored a variety of modularized programs and, ultimately, created their own: a combined Introductory and Intermediate Algebra course.

The new course was piloted in 2009 and 2010, and was formally implemented in 2011 with the hypothesis that students would complete the two courses more quickly—and with fewer gaps in knowledge—in a mastery-based, modularized format.

Implementation

At the beginning of each semester, students take a series of MyMathLab pretests that mimics the learning outcomes of that module. They have five days to prove mastery by earning an 80 percent or higher on each module pretest. If they score below 80 percent, they are required to complete personalized homework and other remediation offerings before attempting the pretest a second time. Students who score 80 percent or higher on the pretest earn credit for that module and are allowed to start the next module's pretest. At the end of the five days, students are placed into the appropriate module as indicated by their demonstrated knowledge.

Because so many students place into Module A, faculty create groups within that class based on pretest performance; lecture and classroom activities are adjusted based on the needs of each group. Students spend 15 days in each module before either repeating it from the beginning or moving to the next one.

¹http://www.msubitillings.edu/catalogs/ug_2013-2015/pg020.html

Faculty use the program's announcements feature and rely heavily on the Search/Email by Criteria function in the gradebook, which enable them to make contact with every student and offer feedback based on weekly performance.

The following MyMathLab prerequisite activities are designed to ensure mastery of each module:

- **Homework.** Students must score 100 percent on MyMathLab homework (generally 1 assignment per section, 12 assignments per module, 10 questions per assignment, and 3 attempts per question). Students may miss one question and still move to the next assignment so that they continue to progress, but must successfully complete any skipped problems before taking the module exam. Students who unsuccessfully use all their attempts must meet with an instructor for tutoring.
- **Quizzes.** Students must score 80 percent or higher on MyMathLab quizzes (3–4 per module, no learning aids). Quizzes are untimed, and questions are pulled from the homework assignments. Students who earn less than 80 percent are required to complete personalized homework generated by MyMathLab based on their quiz performance. Students who score less than 80 percent on their second attempt must show their work to an instructor who either gives them partial credit or approves a third attempt.
- **Tests.** Students must score 80 percent or higher on paper-and-pencil, in-class tests in order to pass each module. If a student earns 77–80 percent, the instructor individually regrades the test and decides if the mistakes were major or minor; students who earn 70–77 percent receive a review from a different instructor.

In addition to MyMathLab's prerequisites feature and personalized homework capabilities, faculty use the program's announcements feature and rely heavily on the Search/Email by Criteria function in the gradebook, which enable them to make contact with every student and offer feedback based on weekly performance.

Assessments

The final grade for each module is weighted as follows:

- 90 percent Module test (*paper-and-pencil, in class*)
 10 percent Process assignments from book or in class

Students must demonstrate mastery in MyMathLab in order to take the module tests. Mastery is demonstrated by completing all MyMathLab homework and earning a score of at least 80 percent on all module quizzes; it is not weighted toward the final course grade.

Results and Data

Data were analyzed for both the stand-alone Introductory Algebra and Intermediate Algebra courses (traditional) and the combined Introductory and Intermediate Algebra course (module). Although Table 1 shows a lower pass rate for the redesigned, modular course, the course completion rate improved by an average of five weeks.

For comparison purposes, data from the modularized course were examined according to who *would have* placed into either of the traditional courses (Table 2).

- Similar pass rate trends emerged for both formats.
- 46.29 percent of the module students who would have placed into the traditional Introductory Algebra course

Format	Performance Metric	Failed	Passed
Module	Average GPA	1.1	2.6
	Average number of weeks to completion	10.3	13.3
	Average pre-COMPASS score	22.6	27.2
	Percentage of students	46.50%	53.50%
	Number of records	472	543
Traditional	Average GPA	1	2.5
	Average number of weeks to complete	18.5	19
	Average pre-COMPASS score	23.8	29.7
	Percentage of students	39.07%	60.93%
	Number of records	463	722

Table 1. Modular and Traditional Format Performance Metrics, Fall 2011–Spring 2014 (n = 2,200)

Format	Performance Metric	Failed		Passed	
		Module	Traditional	Module	Traditional
Introductory Algebra	Average GPA	1.1	1.2	2.6	2.5
	Average number of weeks in course	9.8	18.9	13.9	31.4
	Average pre-COMPASS algebra score	20.2	20.6	21.5	22.4
	Percentage of students	53.71%	66.90%	46.29%	33.10%
	Number of students	384	289	331	143
Intermediate Algebra	Average GPA	1.1	0.7	2.5	2.4
	Average number of weeks in course	12.6	17.8	12.5	15.9
	Average pre-COMPASS algebra score	32	29.9	34.7	31.8
	Percentage of students	29.33%	23.11%	70.67%	76.89%
	Number of students	88	174	212	579

Table 2. Modular and Traditional Format Performance Metrics by Introductory Algebra and Introductory Placement, Fall 2011–Spring 2014 (n = 2,200)

passed the course, compared with a 33.10 percent pass rate for traditional Introductory Algebra students.

- Students in the module course who would have placed into the Introductory Algebra course took an average of 13.9 weeks to complete the sequence. In contrast, students who took the traditional course sequence took an average of 31.4 weeks—more than twice as long as the module students.

Even more encouraging are the module course’s subsequent success rates. Figure 1 shows an analysis of final course scores from seven courses students can take upon completion of either Intermediate Algebra (traditional) or Introductory and Intermediate Algebra (module). When controlled for pre-COMPASS scores, the difference between the subsequent performance of module and traditional students was found to be statistically significant in two of three courses most likely to be taken after developmental studies. In both cases, students from the modular course performed better. Module students scored 8 percent higher in College Algebra (p value $< .01$) and 7 percent higher in Finite Mathematics (p value = $.05$) than their counterparts who took the traditional, two-course sequence.

Students in the modular section also scored 7 percent higher in Introduction to Statistical Concepts, the third most common course to follow the developmental math sequence. These results were not statistically significant (p value = $.81$).

Figure 1 shows a box-and-whisker plot of module and traditional student performance in college-credit courses.

Scores were rescaled according to students’ pre-COMPASS scores. For each course, a dot is an individual data point, or score, for a particular student. The whiskers extend 1.5 times the interquartile range, thus illustrating the entire distribution. The boundary between the two shaded areas is the median for the distribution of scores, and the entire shaded area (box) is 50 percent of the student body—the lighter green represents percentiles 50–75, the darker green represents percentiles 25–50.

The Student Experience

An end-of-semester survey was distributed to all students in spring 2015 ($n = 136$). Of the 66 students who participated in the survey, 13 were enrolled in the traditional Introductory Algebra course, 30 were enrolled in the traditional Intermediate Algebra course, and 23 were enrolled in the modular combination Introductory and Intermediate Algebra course.

Students self-selected enrollment in the modular, combined course or the traditional, two-semester Introductory Algebra and Intermediate Algebra sequence. They were given information describing the module course, and it is believed that word of mouth also helped students make their decisions. When asked why they chose the course they did, more than half of the students (34 of 62) were either unaware of the other option or were advised to take that particular course.

Responders from the modular, combined course were asked to assess the components of the course (Table 3).

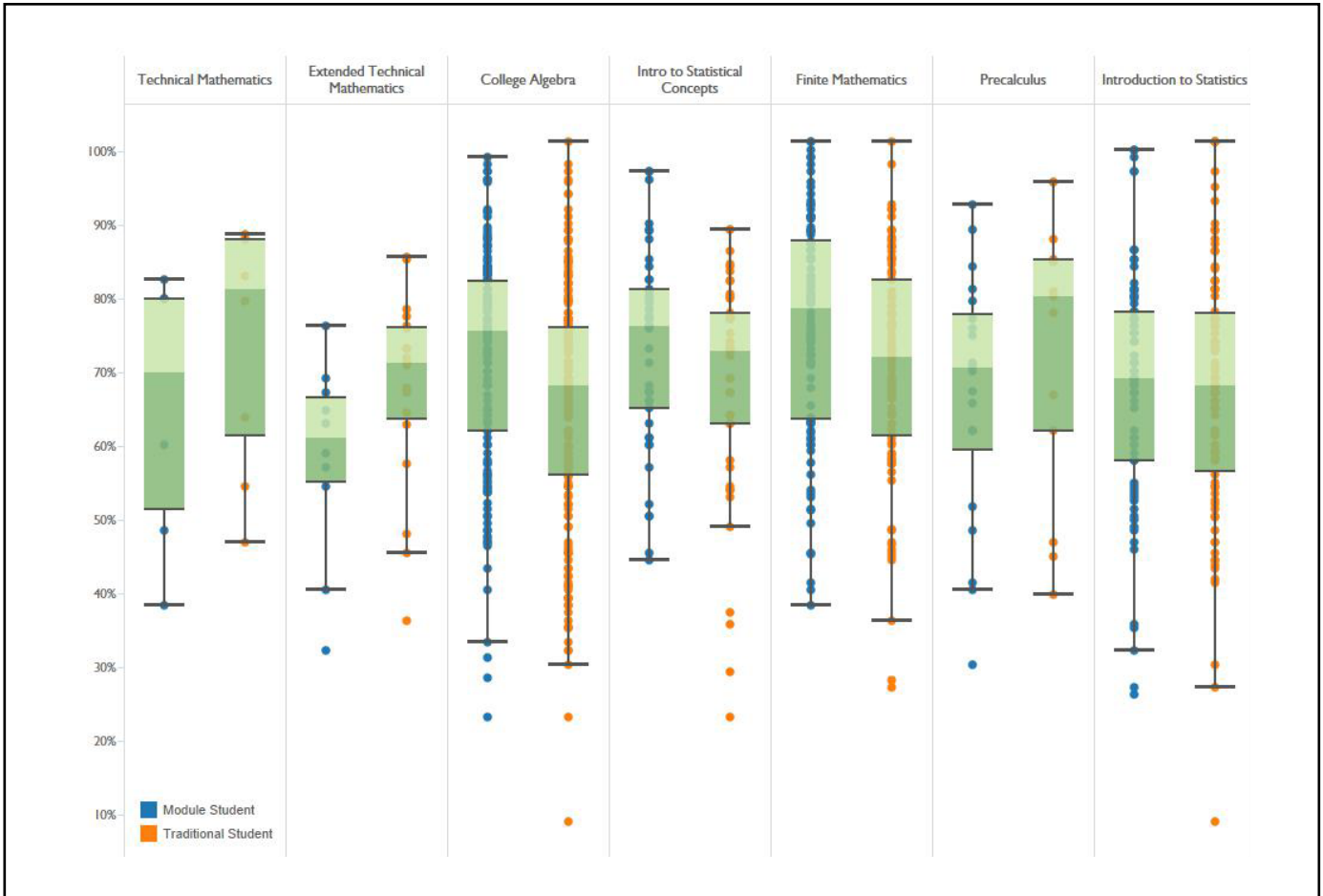


Figure 1. Module and Traditional Student Performance in College-Credit Courses, Fall 2011–Spring 2014 (Technical Mathematics, $n = 19$; Extended Technical Mathematics, $n = 31$; College Algebra, $n = 383$; Intro to Statistical Concepts, $n = 103$; Finite Mathematics, $n = 210$; Precalculus, $n = 41$; Introduction to Statistics, $n = 192$). Note: The grade on the y-axis is the pre-COMPASS controlled grade, and this accounts for the variation. The formula for this grade translation is based on the average pre-COMPASS Algebra score (27), the standard deviation (9), and the standard deviation of the letter grades (10 percent), and then is rescaled to be between 0 and 1 (hence dividing by 1.1).

Course Component	Very Beneficial	Somewhat Beneficial	Somewhat Unhelpful	Very Unhelpful
Taking placement tests during the Review and Assessment Block to determine which module you were placed into	11	8	1	3
The opportunity to test out of modules during the Review and Assessment Block	11	8	0	4
The requirement of repeating modules you had not yet mastered*	8	6	4	4
The mastery requirements of MyMathLab homework and quizzes	11	6	2	4
The “practice for quiz” before your second attempt	10	9	1	3

Table 3. Student Survey Responses, Spring 2015 ($n = 66^{**}$)

*One student left this question blank.

**Sixty-six out of 136 students took the survey; 23 of those students were enrolled in the modular course, and all 23 answered the survey questions.

(continued next page)

Although some students responded that they felt the 80 percent or 100 percent thresholds were too high, their comments indicated that they understood and appreciated the rationale behind it.

Comments suggest that they understood the value of and appreciated the placement tests.

- *“The amount of information in the [combined, modular] course is extreme, but the placement test placed me exactly in the correct spot and so far I have succeeded.”*
- *“I loved that we tested out so we knew if we understood it enough to move ahead.”*

Students also seemed to understand the requirement to repeat modules that weren't mastered.

- *“It really made me want to work hard to make sure I didn't have to repeat any of the modules.”*
- *“If I failed to learn something, I had to redo it before moving on.”*
- *“It's very important to move on only when you have mastered the material.”*

Similarly, although some students responded that they felt the 80 percent or 100 percent thresholds were too high, their comments indicated that they understood and appreciated the rationale behind it.

- *“Even though it's a lot of work and sometimes hard to make time for it all, in the end it's very helpful. Doing the problems over and over helped me better understand them.”*
- *“Scoring 100 percent is difficult, but I study more carefully and the Help Me Solve This button is awesome.”*
- *“Although [the threshold] was hard, it helped me when it came to the test.”*

The students who responded to the survey repeated this awareness when asked about the amount of time required by the personalized practice quizzes before allowing second attempts: they understood the purpose behind it and, ultimately, saw that it helped them.

- *“This is a pain in the butt, but I have to admit, it better prepared me to take the quiz.”*
- *“Seemed very tedious at the time, worth it in the end.”*
- *“I liked that it forced me to work on problems that I didn't fully understand.”*

The modular, combined course relies heavily on email communication to promote that students feel connected to and supported by their instructors. According to the student survey, 100 percent of responders received email communications from their instructor (via MyMathLab's Search/Email by Criteria feature). Twenty-two of the 23 responders reported that the email was “mostly positive;” 18 of the 23 reported that it “motivated them to make a change in behavior or performance.” According to one student, “If I fell behind, [my instructor] let me know. In turn I was better motivated to work on assignments.”

Conclusion

When asked about the school's progress in achieving its goals for the combined course, Chairsty Stewart, developmental education department chair, points to the student survey comment: “MyMathLab is difficult, but it's preparing me for harder math.”

“That's our goal,” she says. “We're trying to prepare students for success in their next courses—and we're getting there.”

Future plans include requiring students to come to class to learn the results of their first tests versus checking online. The department noticed that students who don't pass their first test are hard to retain. Faculty hypothesize that if students are required to attend class, instructors will have the opportunity to encourage them to persevere and coach them on how to improve.

Product Name MyMathLab

Course Name PowerTrack Math (Elementary Algebra)

Course Format Hybrid: One 100-minute lecture and three required lab hours per week

Key Results

In a hybrid redesign of developmental math where students meet for lecture once a week and spend three hours per week in the computer lab, of the 91 percent of first semester completers who took the subsequent course the very next semester, 92 percent passed the next course.

Submitted by

Marianne Morea, Math Redesign Coordinator

Course materials

MyMathLab and *Elementary Algebra: Early Graphing*, Angel

Setting

SUNY College at Old Westbury is a dynamic and diverse public liberal arts college and part of the State University of New York system. With just about 4,500 students, SUNY College at Old Westbury serves as the only public liberal arts college on Long Island. The school's one-year retention rate for students entering in the fall of 2013 was 86 percent, and graduation rates for students entering in 2009 were 22 percent (four-year graduation rate) and 34 percent (five-year graduation rate).

The "PowerTrack Math" course is intended to develop an appropriate level of mathematical literacy to prepare the student for college level courses in mathematics (college algebra, statistics or an alternative) as well as courses in other disciplines. The course covers numerical, algebraic, and graphical problem solving and includes real number arithmetic as well as topics in Introductory Algebra.

Challenges and Goals

The Elementary Algebra course at SUNY Old Westbury had poor passing and retention rates, and the Provost wanted them to improve. Having heard about the redesign at Louisiana State University, the Provost mandated that the department redesign or lose the course. Marianne Morea, redesign coordinator, hypothesized that creating a hybrid course would improve student retention and pass rates.

Implementation

Responding to the Provost's mandate to improve outcomes in the Elementary Algebra course, Morea and her colleagues decided that they would start with the LSU implementation model and make some changes to fit their students and school. They created "PowerTrack Math," which is Elementary Algebra content taught in a hybrid format, where students meet for one 100-minute session in the lecture hall each week and spend three hours in the math lab working on their math assignments in MyMathLab. Unlike LSU, SUNY Old Westbury offers students partial credit for their lab attendance, so if they attend lab for 90 minutes one week, they get half credit.

Students take all homework, quizzes, and tests in MyMathLab. Homework and quizzes can be done anywhere, but tests and the final are proctored in the math lab. The course has fixed due dates, and all homework assignments have a 10 percent deduction if submitted up to 1 week late. The courses typically have 10–11 quizzes per semester, and the top eight are counted toward the student's grade, so no late submissions are allowed.

The department allows unlimited submissions for the homework and three submissions for each quiz. They take the best score of the three attempts, and students have no access to learning aids during quizzes. Tests are scheduled, proctored, and password-protected with blocked access using the browser lockdown feature in MyMathLab.

In addition, the department assigns a review homework in MyMathLab before every test and then averages those review homework scores to count it as a test. The department believes that the test-score incentive helps students take the review homework seriously.

Assessments

- 40 percent MyMathLab test grades (five)
(Three of these are proctored and password protected tests; two are review assignments. Students may drop one test grade if they have fewer than three absences from lecture.)
- 30 percent MyMathLab final
(Proctored, password protected)
- 10 percent MyMathLab quizzes
- 10 percent MyMathLab homework
- 10 percent Lab attendance

Results and Data

Upon implementation of MyMathLab, SUNY Old Westbury immediately saw improvements in pass rates. For fall semesters leading up to the implementation of redesign (2002–2006), pass rates averaged 69.6 percent ($n=540$). As shown in Figure I, the first fall semester of the hybrid redesign resulted in a pass rate of 75.5 percent. Fall semester pass rates from 2007, the first semester of implementation, through 2014 have averaged 79.5 percent. Over spring semesters, post-redesign pass rates average 67.5 percent ($n=465$), compared to an average pre-redesign spring pass rate of 61.7 percent from spring 2003 to spring

2007. Thus, fall post-redesign averages were up 14 percent, or 9.9 percentage points, and spring post-redesign averages were up 9 percent, or 5.8 percentage points.

A chi-square test of independence was performed to examine the relation between fall pass and fail rates and pre- (FY 02/03–FY 06/07) and post- (FY 07/08–FY 14/15) redesign. The relation between these variables was significant, $\chi^2 (1, N=2,059)=21.89, p<.001$. Academic pass rates increased from 69.6 percent before the redesign to 79.5 percent after the redesign.

A chi-square test of independence was also performed to examine the relation between spring pass and fail rates and pre- (FY 02/03–FY 06/07) and post- (FY 07/08–FY 14/15) redesign. The relation between these variables was significant, $\chi^2 (1, N=1,170)=438.28, p<.001$. Academic pass rates increased from 61.7 percent before redesign to 67.5 percent after redesign.

It should be noted that prior to fall 2010, a C– was considered passing and was the grade required to move on to a proficiency level course. In fall 2010 the requirement was raised to a C. While very few students earned C– grades in PowerTrack Math, according to Morea, there were many in the pre-redesigned Elementary Algebra course, which inflated that pass rate slightly. For this case study data analysis, all C– level grades were considered passing because C– data was not available for all semesters.

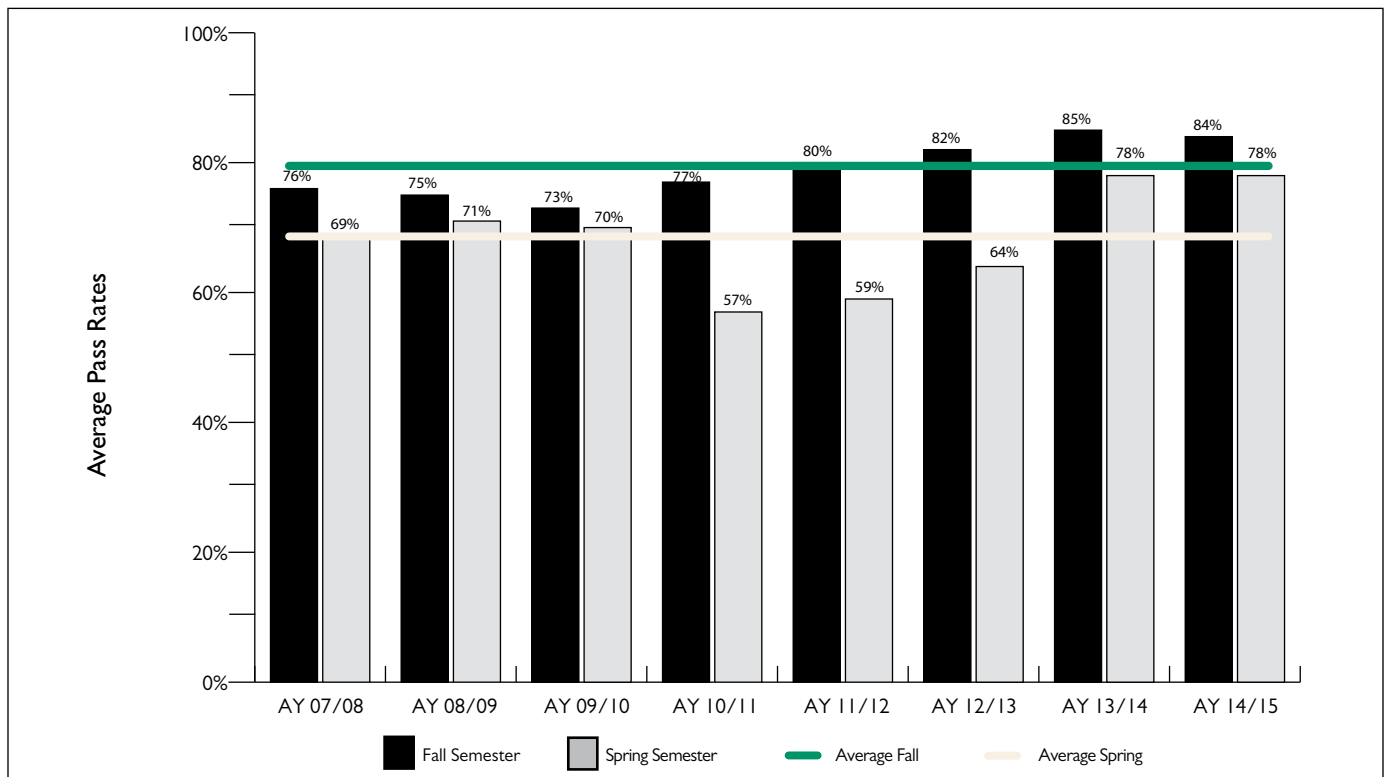


Figure I. PowerTrack Math Pass Rates Post Redesign for Fall and Spring Semesters, Assessment Years 2007-08 Through 2014-15

Students are incentivized to take the review homework seriously when the scores are tallied, averaged, and counted as a test.

Because pass rates increased significantly post-redesign, it was expected that retention rates would also improve. However, fall retention rates improved by .5 percentage points post-redesign, and spring retention rates dipped by 2.3 percentage points. A chi-squared test was run to examine the relation between pre- and post-redesign retention rates, and the difference in both semesters was found to be not significant (Fall: $X^2(1, N = 2,059) = .12, p = .73$; Spring: $X^2(1, N = 1,170) = 1.44, p = .23$.) One possible explanation for these results, Morea believes, is due to the fact that the pre-redesign MA0500 course was a 0-credit course. “It did not impact students’ GPA, so very frequently, students did not bother to withdraw,” she posits, “most likely in order to maintain enrollment for financial aid purposes. Our withdrawal rates were probably higher pre-redesign, but we can’t know that because students didn’t officially withdraw.” According to Morea, this issue is part of the reason that PowerTrack became a two-credit course. It was felt by the committee that this would give it some impact on a student’s GPA and the department would be able to tell whether a student actually failed but tried or failed because they quit, or unofficially withdrew.

Finally, Morea believes that what’s more telling about the success of the redesign is the success she reports students are experiencing in the subsequent course. For first semester completers moving into the next course, Morea reported that 91 percent took the subsequent course the very next semester, and 92 percent of those students passed the next course. Though comparison data from her previous semesters were unavailable, according to Morea, this 92 percent pass rate was better than the previous developmental math course produced.

The Student Experience

According to a survey distributed to students in the redesigned course, responders appreciate the way the course is structured. More than 80 percent of students responded to the end of semester survey, reporting that MyMathLab was very helpful, and the tutors were helpful and encouraging. Responders also liked only attending one lecture per week and reported that having their instructors in the lab made it easier for them to keep in contact with the instructor.

Morea also believes students have a better work ethic and student attitudes have improved. “They know they’re ultimately responsible for their learning this way. Previously, I think they thought it was our job to get them to learn. Now they know we’re here to help them but we can’t do it for them.” Morea says that students like the course so much, in fact, that they strongly requested that other courses move into the same format, which led to the eventual redesign of the College Algebra course at SUNY Old Westbury.

Conclusion

Morea says that without support from the administration, the overhaul of their course would not have happened as quickly as it did. In addition, she reports that the school has experienced cost reductions for the course, which has led to the administration continuing to support tutors in the course, despite budget cuts across the campus. Moving forward, Morea says they plan to continue to monitor their students’ progress and subsequent success to ensure they’re still providing the best course possible. “I think we’ve done a great job so far, but we will continue to monitor and improve and change things as needed.”

Product Name MyLabsPlus

Course Name Beginning Algebra

Course Format Hybrid: Scheduled meetings, open lab, fixed due dates

Key Results After requiring that poorly performing students complete personalized homework assignments between quiz attempts, instructors believe that students studied more effectively, and average pass rates increased nearly 20 percent.

Submitted by

Patty Bonesteel, Senior Lecturer

Course materials

MyLabsPlus and *Elementary Algebra: Concepts & Applications*, Bittinger

Setting

Wayne State University is a public research university serving nearly 32,000 graduate and undergraduate students. The school's Beginning Algebra course enrolls a wide spectrum of skill levels; many students do not have command of numerical and beginning algebra concepts and techniques.

Challenges and Goals

Patty Bonesteel, senior lecturer, reports that her biggest challenge is motivating students to prepare for assessments. In the past, students could finish one quiz attempt and immediately attempt another, without additional study or remediation. As a result, students were frustrated that they were not performing well on quizzes despite multiple attempts, and they then performed poorly on exams.

Implementation

Wayne State's math lab comprises both a classroom and an open lab, containing 75 computers each. Students meet in the classroom portion with an instructor two hours per week. The instructor lectures on difficult topics, and students begin their MyLabsPlus homework with personal attention and tutoring available from the instructor and an assistant. Supervised lab time is also used for proctored exams.

Students are also required to spend three additional hours per week, on their own, in the open lab. During this time, they complete MyLabsPlus homework and password-protected quizzes.

Students complete 38 graded MyLabsPlus homework assignments, one for each section of the textbook, by a designated due date. They have unlimited attempts, and three points are awarded for scores of 100 percent. Scores of less than 100 percent earn that percentage of two points. The three lowest homework scores are dropped.

Students complete 20 MyLabsPlus quizzes, one after (approximately) every two sections of the text. Quizzes must be completed in the math lab before a due date, and the lowest three are dropped. Students have two attempts at each quiz, excluding the syllabus quiz and the MyLab/Mastering quiz. Before retaking a quiz, students must score 100 percent on a personalized assignment. The highest grade is counted, and all quizzes must be taken in the open lab.

Each of the four tests and the final exam have a corresponding MyLabsPlus practice test that counts toward a student's grade. Students who earn less than 80 percent on a practice test are strongly encouraged to use the Study Plan and repeat the practice test before taking the actual test. Each practice test may be taken an unlimited number of times, and only the highest score is counted.

Students take four, 75-minute tests in MyLabsPlus. Tests are given during class time. At the end of the semester, the final exam score, if it is higher, replaces the lowest test score.

A comprehensive final exam is assigned the final week of class. It is taken in MyLabsPlus and is timed at 2.5 hours. Students must earn a minimum of 60 percent in order to pass the course, in addition to an overall score of 70 percent.

Students who wish to work ahead and/or complete the course early are encouraged to do so. Arrangements may be made with the instructor to take tests ahead of schedule. In order to be eligible for early testing, students must have: (1) completed all of the homework assignments and earned a score of 100 percent on each section, (2) completed all quizzes with a best attempt of at least 80 percent on each, (3) passed all prior tests, and (4) scored at least 80 percent on each practice test.

Assessments

37.9 percent	MyLabsPlus tests (four)
31.6 percent	MyLabsPlus final exam
10.8 percent	MyLabsPlus quizzes (best 17 of 20)
6.6 percent	MyLabsPlus homework (best 35 of 38)
3.2 percent	MyLabsPlus practice tests (five)
3.2 percent	Participation
2.7 percent	Lab attendance
2.0 percent	Class attendance
2.0 percent	Orientation

Results and Data

During each of the three semesters after required, personalized homework between quiz attempts was implemented, pass rates increased: by 8.5 percentage points in fall 2010, by 10 percentage points in the winter 2011, and by 7.1 percentage points in spring 2011 (Figure 1).

The Student Experience

Students were the impetus behind the implementation of personalized homework. Although instructors were aware that students weren't studying between quiz attempts, Bonesteel maintains that it was students' frustration with their poor exam performances that ultimately motivated the change.

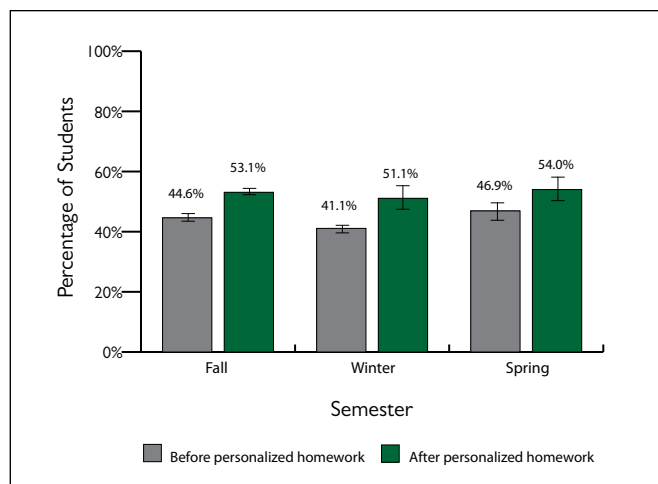


Figure 1. Average Pass Rates before and after Implementation of Required Personalized Homework, Fall 2000–Spring 2011 (Before includes 11 years of data: 11 fall semesters, $n = 9,977$; 11 winter semesters, $n = 7,466$; 11 spring semesters, $n = 2,581$ / After includes 3 1/3 years of data: four fall semesters, $n = 3,415$; three winter semesters, $n = 1,697$; three spring semesters, $n = 391$)

Across the board, students are happier with the course now and are performing better. According to one student, “I really enjoyed this course. It was different than how I thought it would be. I liked that the homework had infinite tries, and that [MyLabsPlus] View An Example was there to help. I also liked that I could see my test and quiz scores, and that we were given a second chance on quizzes.”

Conclusion

Bonesteel believes that the personalized homework requirement between quizzes is the best change they have made as a department, and student performance data indicates she is correct. In addition, she says that moving to MyLabsPlus has made the first day of class much easier as students are automatically enrolled in the right course and do not have to worry about funding—materials are paid for via a course fee.

Future plans include the possibility of combining the Beginning and Intermediate Algebra classes into one Developmental Math course. Students in the combined course would be allowed to go as far in that course as possible during a semester and start again where they left off during the next one.

Product Name **MyStatLab**
 Course Name **Introduction to Statistics**
 Course Format **Face-to-face**

Key Results Analysis shows that even after controlling for homework scores, percent of homework completed makes a significant contribution to explaining the variance in the average combined test and final exam scores. Based in this simple regression model, for each percent of homework completed, there is a 0.25 increase in the average test and exam scores.

Submitted by
 Joseph Diaco, Professor and Department Chair

Course materials
 MyStatLab and *Elementary Statistics: Picturing the World*, Larson and Farber

Setting
 Camden County College (CCC) is one of the largest, most comprehensive community colleges in New Jersey and the surrounding region and is a vital resource for transfer education, workforce training, and cultural events. Its three campuses share the common mission of providing accessible, affordable higher education and occupational study. Camden ranks among the top 100 community colleges for associate's degrees completed by African- and Asian-American students.

The statistics course provides a basic introduction to statistical concepts and methods and is comprised mostly of nursing students plus many business, criminal justice, and liberal arts majors. Some students are attempting the course for the second time and there are some non-traditional students. The course is taught face-to-face, meeting two to three times per week, depending on the class day.

Challenges and Goals
 Having taught statistics for several years, Joseph Diaco found that his students needed more accountability. Although students were required to complete homework problems and turn them in, due to limited resources their papers were not graded but instead spot-checked for completion. This practice led to students not taking their homework assignments seriously. In order to help students see homework as important, even vital, to their success, and to improve their understanding of course-level learning outcomes, Diaco began to require students to complete homework in MyStatLab. He hypothesized that doing so would increase student success.

Implementation
 Diaco uses MyStatLab primarily for homework and quizzes to be completed outside of class. He allows three attempts at each homework question, and one attempt at each question on timed quizzes. Students are given extra credit for points earned in the MyStatLab Study Plan. In the MyStatLab course Diaco uses, there are 160 target points available in the Study Plan, so he gives one point of extra credit for every 16 points earned. These points are added to the student's lowest test score.

Assessments
 70 percent Tests (paper and pencil)
 20 percent Cumulative departmental final
 10 percent MyStatLab homework

Results and Data
 Based on an analysis of all of Diaco's course sections, 88 students total, students completed an average of 70.6 percent of the homework assignments, with the percent ranging from 0 to 83.3 (Table 1). Diaco drops the four lowest homework scores and two lowest quiz scores; nobody completed 100 percent of the homework. The average homework score was 85 out of 100 points, and the average test score was 76 out of a maximum of 105.2 points.

	Mean	Standard Deviation
Percent of homework completed	71	20.60
Average homework score	85	16.40
Average test score*	76	17.29
Overall course score	67	27.44

Table 1. Student Performance Averages, Fall 2013 (n = 88)
 *Test score was missing for one student.

Variable	Average of the test and final exam scores			
	MODEL 1		MODEL 2	
	B	SE B	B	SE B
Intercept	39.00**	9.15	37.04**	8.94
Average Homework Score	0.43**	0.11	0.25	0.13
Percent of Homework Completed			0.25*	0.10
R^2	.17**		.22	
F	16.82**		11.80**	
ΔR^2			.05	

Table 3. Results of Regression Analysis by First Considering Homework Score as a Predictor and then Percent of Homework Completed as a Predictor, Fall 2013 ($n = 88$)

Note: The average homework score for each student is calculated after dropping the four lowest homework scores, according to the instructor.

* $p < .05$. ** $p < .01$.

Analysts constructed two regression models, first by having average homework score as the only predictor and then adding the percent of homework completed to the regression model to determine the increase in variance accounted for by percent of homework completed after controlling for average homework score (Table 2).

Model 1 in Table 2 shows that when only average homework score was entered into the regression model, the results suggest that the average homework score is a significant contributor to the average of the test and final exam scores, $F(1, 85) = 16.82$, $p < .01$, with the amount of variance explained by the average homework score given by $R^2 = .17$.

Next, the percent of homework completed was added using a stepwise regression model after controlling for average homework score (Model 2 in Table 2). Average homework score is now found to make a non-significant contribution to the average of the test and final exam scores while percent of homework completed is a significant predictor, $p < .05$. Thus, even after controlling for homework scores, percent of homework completed still makes a significant contribution to explaining the variance in the average of the test and final exam scores. Specifically, based in this simple regression model, for each percent of homework completed, there is a 0.25 increase in the average test and exam scores.

The Student Experience

Diacio distributed a survey to his fall 2013 students; 83 of 88 students completed the survey. Responders reported positive experiences with and thoughts about MyStatLab. Table 3 shows the features that students found most helpful.

When asked if they would prefer that instructors use either MyMathLab or MyStatLab in future classes, 71 students, or 85.5 percent of those surveyed, answered “Yes.”

Feature	Percentage of Students
Help Me Solve This	96.4
Ease of Use	94.0
View an Example	92.8
eText	74.7

Table 3. Percentage of Students Who Found Certain Features Helpful in MyStatLab, Fall 2013 ($n = 83$)

Conclusion

Based on the results of this analysis, Diacio has added “concept question” homework assignments for each section. These questions were not available during the implementation phase of this study. Students are also now assigned StatTalk video questions with the associated media set as a prerequisite.

Diacio is pleased with the results he has seen since requiring MyStatLab in his course and plans to continue using it for the foreseeable future.

Product Name MyStatLab

Course Name Business Statistics

Course Format Fully online

Key Results

After personalizing his online Business Statistics course, adjunct instructor Delbert Spear saw improvement in course pass rates, with As and Bs increasing 245 percent and Fs decreasing by 100 percent. Students who utilized their two attempts on quizzes and tests increased their scores by 22 percentage points and 10 percentage points, respectively.

Submitted by

Delbert Spear, Adjunct Instructor

Course materials

MyStatLab and *Business Statistics: A First Course*, Levine, Krehbiel, Berenson & Stephan

Setting

Ivy Tech Community College is Indiana's largest public postsecondary institution and the nation's largest singly-accredited statewide community college system, serving nearly 200,000 students annually. Ivy Tech has 32 degree-granting campuses throughout Indiana. It serves as the state's engine of workforce development, offering affordable degree programs and training that aligns with the needs of its communities. In addition, its courses and programs transfer to other colleges and universities in Indiana. It is accredited by the Higher Learning Commission and is a member of the North Central Association. The school is an open-access institution with an average class size of about 22 students.

The Business Statistics course at Ivy Tech is designed to build student competence in the areas of descriptive and inferential statistics through an emphasis on the application of these statistical methods. Taught out of the Business department, the course includes an examination of data, probability of occurrence, and basic sampling processes and uses statistical methods to model results and then uses these models for forecasting. The course also introduces tests to examine the appropriateness of these techniques. Prerequisites for the course are Introduction to Business and Intermediate Algebra or higher.

Challenges and Goals

According to instructor Delbert Spear, it is no secret that the online Business Statistics course at Ivy Tech is not a favorite among students. He attributes this to the fact that the topics

are difficult and abstract, yet students must pass the course if they are majoring in Business. In fact, Spear maintains that the Business Statistics class at Ivy Tech has the second highest failure rate behind Calculus and typically has around a 20 percent drop rate.

By adopting MyStatLab for his Business Statistics course, Spear hoped to give students an online course that would interest them and provide them the help they need at the time they need it, thus improving the course's student success and drop rate.

Implementation

After having used a competing product, Spear began using MyStatLab in fall 2014. Students who had used MyMathLab in previous courses recommended it and expressed interest in having a similar program in Business Statistics. "It learned with you," according to the students, which was intriguing to Spear. He was aware that at least one Business Statistics course was using MyStatLab at another campus, so he copied that instructor's course, and set out to try it with his classes.

Spear acknowledges, however, that all did not go smoothly that first semester. Grades went down, student surveys were negative, and everyone was frustrated, due, in part, Spear believes, to the lack of personalization and customization of his MyStatLab course. Spear realized that he had taken an out-of-the-box course and handed it to students instead of taking that same course and modifying it to make it completely fit the course he teaches. After figuring out what wasn't fitting, Spear decided to make some changes.

First, Spear changed how assignments are named. He doesn't like to use terms like "test" and "quiz" because he feels they promote anxiety in students, so he now calls MyStatLab quizzes "Chapter Practice," homework is now "Chapter Homework" and tests are "Chapter Review."

“This course, for me, was very much about the application of the information gained from statistical analysis and I feel that I have succeeded in understanding those concepts beyond simply plugging the numbers into formulas for a correct answer.” —Student

Chapter Practice assignments (quizzes) are due each Saturday. Students are allowed two attempts and can complete the assignment in more than one sitting. While there is no minimum score required to move on, students must complete the Chapter Practice assignment before moving on to their personalized Chapter Homework assignment. The homework assignment is built algorithmically based on the student’s Chapter Practice performance and focuses on the objectives they need to work on further. Students are allowed two attempts on their personalized Chapter Homework. If they cannot complete the entire homework in one sitting, they can “save for later” and come back to it. The better the student performs on their Chapter Practice, the shorter the Chapter Homework assignment is because they will need to work on fewer objectives.

Students must submit their Chapter Homework before moving on to MyStatLab’s Adaptive Study Plan, which acts as a personal tutor, updating in real time based on student performance to provide personalized recommendations on what students should work on next. In Spring 2015, Spears began to require that students submit their Chapter Homework assignment before working in the Study Plan because he felt that his Fall 2014 class spent too much time in the Study Plan and not enough time on the Chapter Homework, resulting in low homework grades. If a student does not earn a 70 percent or higher on the homework, the system then directs them to the Study Plan for practice on trouble areas. Once students obtain a 70 percent or better on that chapter’s homework, they then take the Chapter Review (test).

Students are allowed two attempts on the Chapter Review (test) and are allowed to “save for later” on that assignment as well. When choosing questions for the review, Spear uses the diagnostics for each problem that tell him the average amount of time it takes students to complete the problem, and he makes sure he doesn’t assign a review (test) that is longer than 45–50 minutes. The Chapter Review is set up as a personalized assignment from the Chapter Homework, meaning students are automatically given credit on the review for objectives that they mastered in the Chapter Homework, and they do not have to attempt those problems.

Spear allows one makeup on a scheduled Chapter Practice (quiz) or Chapter Review (test) during the semester, but it must be taken within one week from the date missed.

In addition to adding the minimum grade requirement for Chapter Homework assignments, Spear also implemented Discussion Board assignments. Students are required to post comments about assigned topics to the Discussion Board for 14 assignments. Each Discussion Board assignment is worth up to 10 points: up to six points for a student’s initial posting, and up to four points for their responses to two classmates. Late postings are not accepted and cannot be made up.

Spear found that the time he took personalizing the online course in MyStatLab was well worth the effort. After rebuilding the course, he reported that he only had a handful of the “old” issues, such as student frustration and poor course reviews, during the Spring 2015 semester.

Assessments

24 percent	Discussion Board (14 @ 10 points each = 140 pts)
24 percent	Chapter Practice, MyStatLab (14 @ 10 points each = 140 pts)
24 percent	Chapter Homework, MyStatLab (14 @ 10 points each = 140 pts)
24 percent	Chapter Review, MyStatLab (14 @ 10 points each = 140 pts)
4 percent	Syllabus quiz, MyStatLab (1 @ 20 points each = 20 pts)

Results and Data

When analysis was completed on data from Spear’s Spring 2015 class, he was curious to learn how students performed from the first attempt to the second attempt on the Chapter Practice (quiz) assignments and the Chapter Review (test) assignments. Spear also wanted to look at whether students were getting faster as they worked through the material, demonstrating what he calls a “progressive learning element”—meaning, the learning is getting better and easier for the students as they progress through the topic.

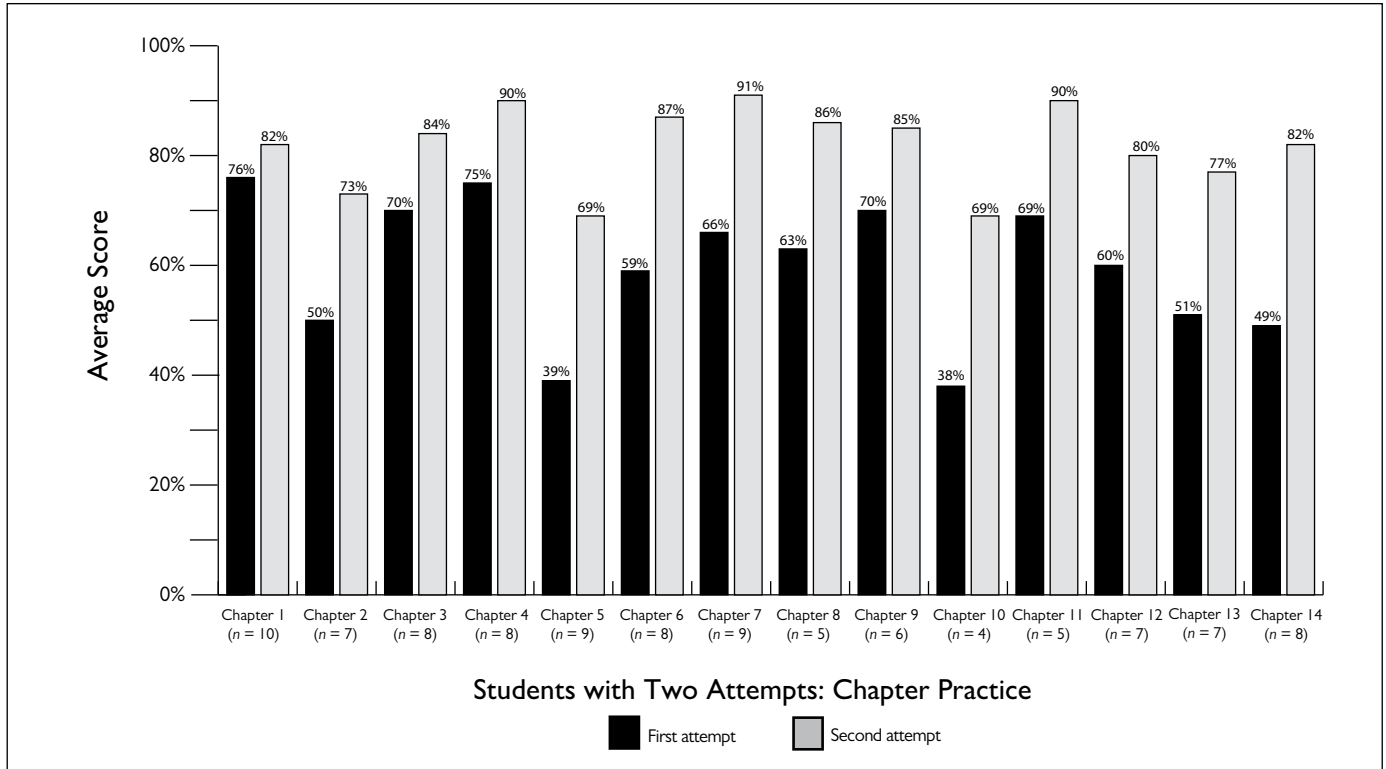


Figure 1. Students Using Two Attempts on Chapter Practice Increased Their Average Score 22 Percentage Points, Spring 2015

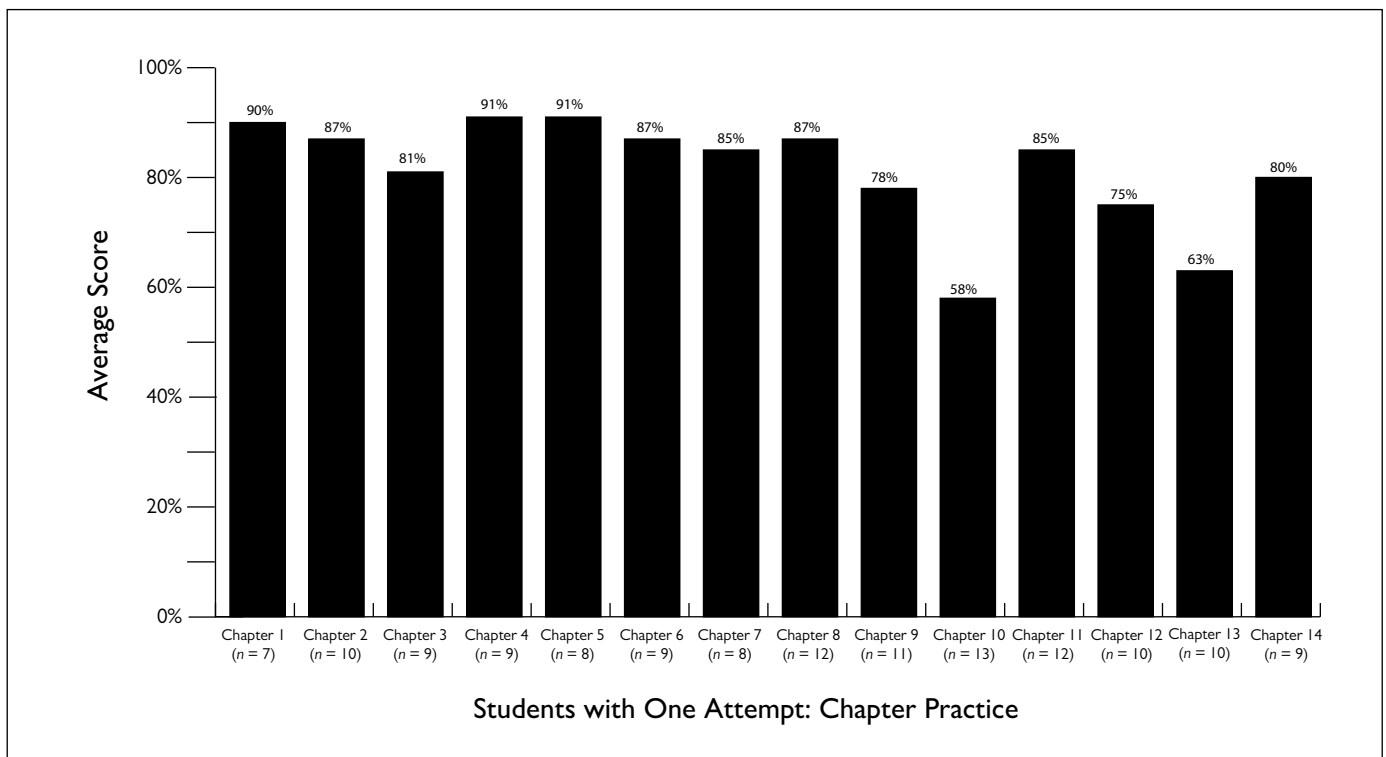


Figure 2. Students Using One Attempts on Chapter Practice Had an Average Score of 81 Percent, Spring 2015

The data from Spear's Spring 2015 class show that, for those students using two attempts, average scores went from 60 percent on the first attempt of Chapter Practice assignments to 82 percent on the second attempt, a 22 percentage points, or 36 percent, increase (Figure 1). Students with one Chapter Practice attempt averaged an 81 percent on these assignments (Figure 2). It should be noted that enrollment in the fully online course is 17. Given this low sample size, the average number of students who had two attempts on Chapter Practice assignments was only seven per assignment, and the average number of students had two attempts on Chapter Review assignments was only three per assignment.

Average scores on Chapter Review assignments for those students using two attempts went from 73 percent on the first attempt to 83 percent, a 10 percentage point, or 14 percent, increase (Figure 3). Students with one Chapter Review attempt earned an average score of 86 percent (Figure 4).

Data also showed that students spent less time on their second attempt than on their first attempt for each type of assignment (more than one hour less on Chapter Practice from attempt one to attempt two), and, further, their time-spent went down from Practice assignments to Review assignments, as depicted in Figure 5. Again, it should be noted that, on average, only

seven of the 17 learners attempted the Chapter Practice a second time and, on average, only three of the 17 attempted the Chapter Review a second time. Moreover, these results coincide with the structure and plan of Spear's course because Chapter Homework is a personalized assignment based on Chapter Practice performance, and Chapter Review is a personalized assignment based on Chapter Homework performance. "These results show that the MyStatLab course is doing what I structured it to do," says Spear. "If students master an objective, they don't have to cover it again, so they spend less time doing things they already know how to do and more time learning what they don't."

Analysis of time spent on Chapter Homework was not conducted because data was only available for each students' best attempt. However, that data showed that, on average, students spent 45 minutes on their Chapter Homework assignments.

In addition, data from Spear's Fall 2014 (first-time use of MyStatLab) and Spring 2015 (redesigned implementation of MyStatLab) courses were analyzed using a *t*-Test assuming unequal variances. Students in Spring 2015 ($M = 86\%$, $SD = 6\%$, $N = 17$) achieved overall grades that were a 47 percent, or 28 percentage point, increase from the previous semester in 2014 ($M = 58\%$, $SD = 29\%$, $N = 18$), $t(19) = -3.92$, $p < 0.05$.

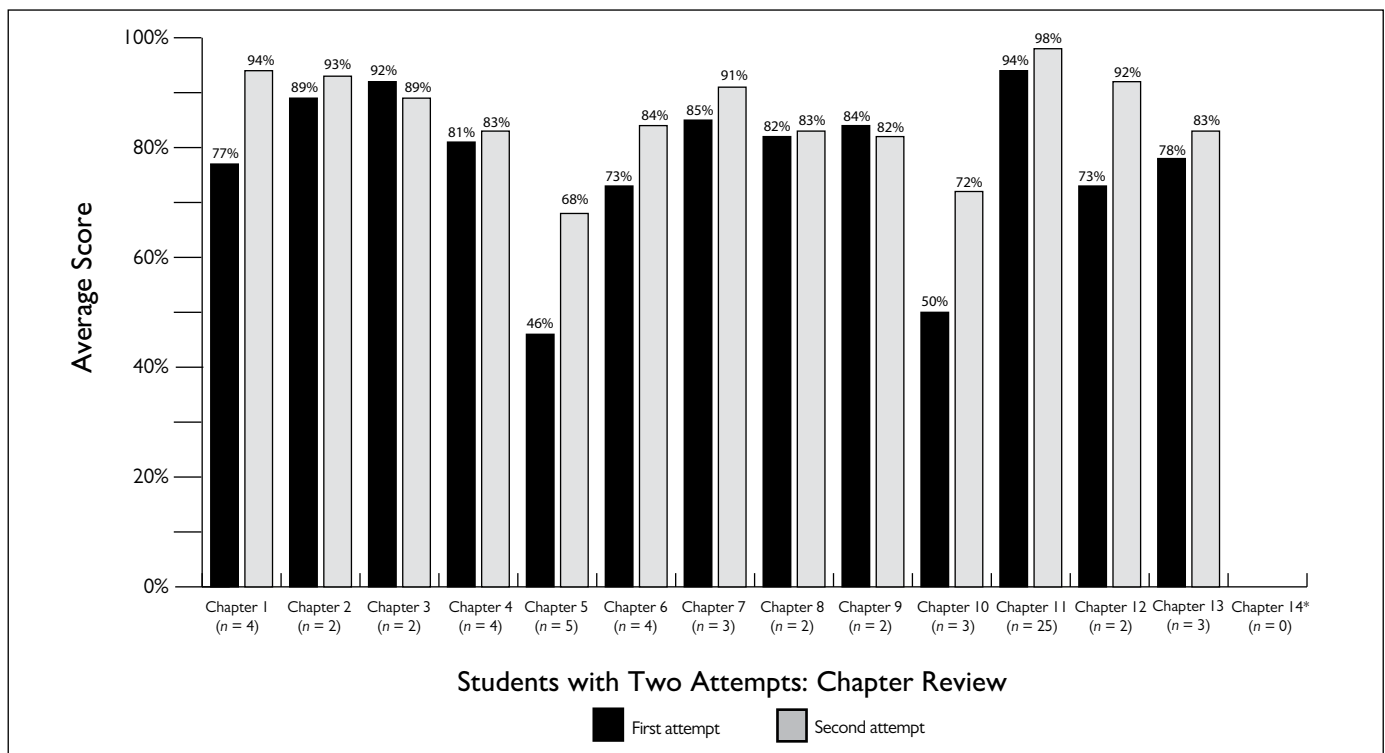


Figure 3. Students Using Two Attempts on Chapter Review Increased Their Average Score 10 Percentage Points, Spring 2015

(* Note: No students attempted the Chapter 14 Review a second time, so there were no students with two attempts for this analysis.)

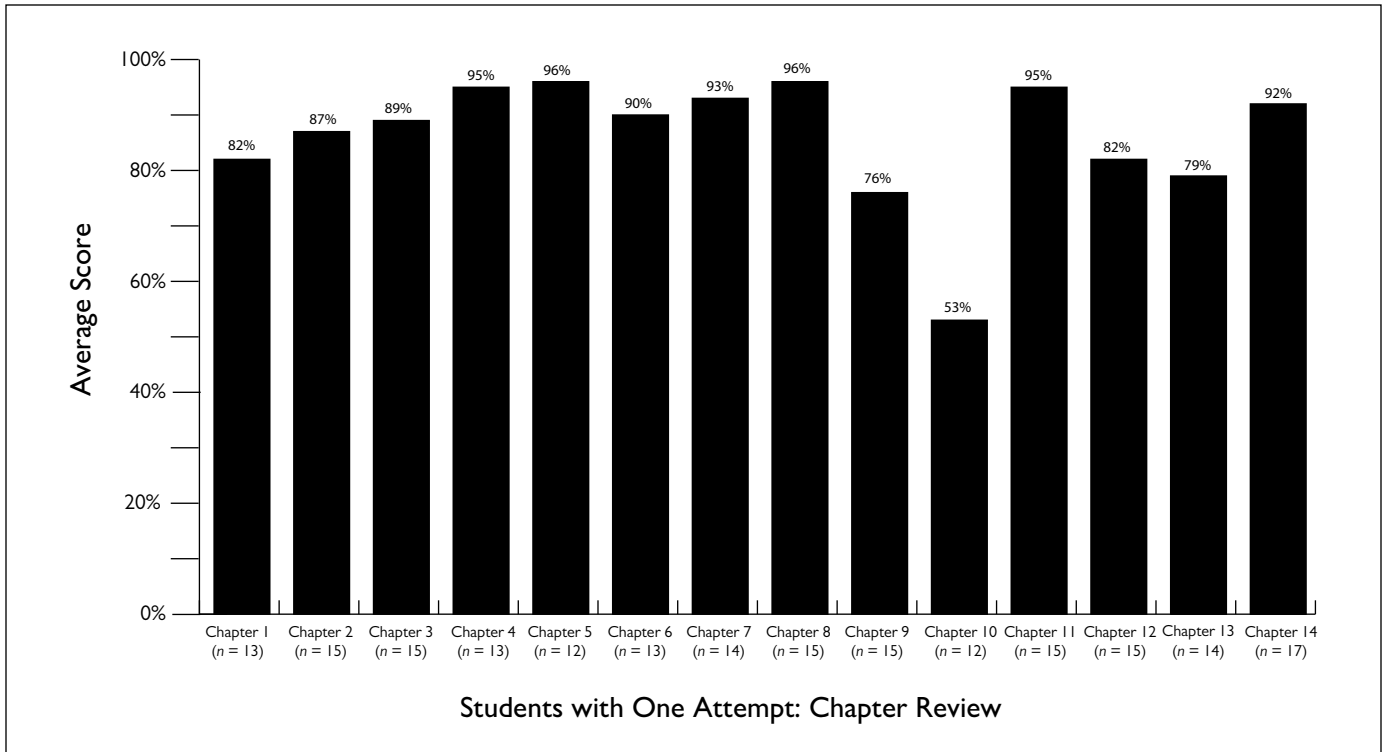


Figure 4. Students Using One Attempt on Chapter Review Had an Average Score of 86 Percent, Spring 2015

Spear attributes this overall performance improvement to the fact that his Fall 2014 MyStatLab course was a “generic” course that he copied from a previous instructor while his Spring 2015 MyStatLab course was completely personalized and customized for the way he wanted to teach his course (see “Implementation”). Figure 6 shows the percentage of students who received each letter grade. Spear is proud of the fact that nobody failed in Spring 2015. “Of course,” he says, “It’s impossible to fail the course unless you just don’t do the work, but look at the increase in the number of A’s and B’s! That, for me, is something to get excited about.”

Finally, data from the Spring 2015 course found positive correlations between students’ scores on Chapter Practice (quizzes) ($r = .90, p < .001$), Chapter Homework ($r = .53, p < .001$), and Chapter Review (tests) ($r = .82, p < .001$) and students’ final course grade. Chapter Practice, Chapter Homework, and Chapter Review each comprised an equal portion (24 percent) of a student’s total grade, influencing this relationship. These positive correlations show a relationship in this course where students’ scores on Practice, Homework, and Review are reflected in their overall performance.

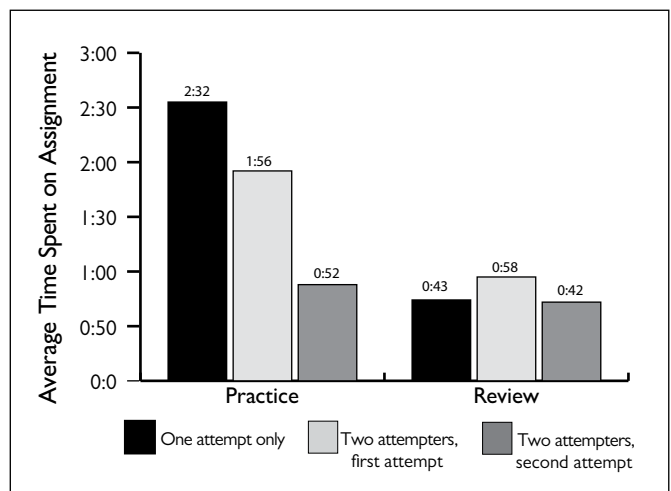


Figure 5. Average Time Spent on Assignments Based on Attempt, Practice and Review Assignments (Spring 2015, $N = 17$; Average n for One Attempt Only, Practice $n = 10$; Average n for Two-Attempters, Practice $n = 7$; Average n for One Attempt Only, Review $n = 14$; Average n for Two-Attempters, Review $n = 3$)

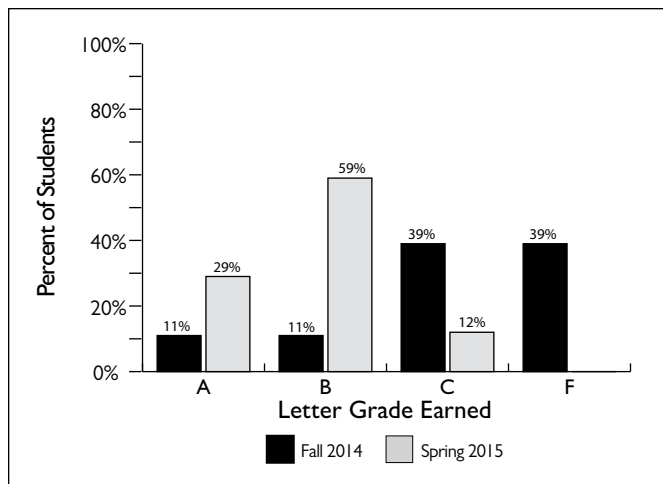


Figure 6. Comparison of Final Letter Grade Earned, Fall 2014 (N= 18: A=2, B=2, C=7, D=0, F=7); Spring 2015,(N= 17: A=2, B= 10, C=2, D=0, F=0)

The Student Experience

In a 10-question survey distributed to students in spring 2015 (13 of 17 responded, 76 percent), 100 percent of responders in both sections said they would recommend the instructor to other students. Their comments reflect an appreciation for the materials used in the course:

- *“I appreciate the multiple learning styles of the class in that there was videos, articles, and work that made the content of the material much easier to understand.”*
- *“I especially enjoyed the discussion boards. They were always on point and a great way to apply the lessons learned from the text and homework. I always felt like I learned something from one of the student’s postings. The use of discussions made for a better understanding of course material than just cramming formulas for an exam.”*

In addition, Spear believes that students’ responses to the question, “What aspects, if any, do you appreciate about the instructor’s teaching?” reaffirmed that renaming the assignments from the conventional “quiz” and “test” to his “Chapter Practice” and “Chapter Review” did what he intended it to do—take unneeded stress away from students. He also reports that he did change the number of problems he assigned in the later chapters to maintain a more consistent workload expected of students. Students commented:

- *“I loved not having tests. I am sure all students would say that, but it took away so much stress and because of that, I felt that I learned more because I was relaxed when doing my assignments. The only thing I would correct would be the number of questions in MyStatLab for some of the later chapters. The material was harder, and there were a lot of questions that really took me a great deal of time to do, like an uncomfortable amount of hours.”*
- *“I appreciate not having midterms or finals because there is a lot of information to learn and tossing it all into one test would be hellish.”*

One student noted that, having taken three online math courses, he believes he learns more in online math classes than in a traditional classroom setting. He also stated that, “This course, for me, was very much about the application of the information gained from statistical analysis and I feel that I have succeeded in understanding those concepts beyond simply plugging the numbers into formulas for a correct answer.”

Conclusion

Spear reports that early fall 2015 student results are holding steady with the previous semester. “I’ll be really excited to see how this fall goes, but I think it’s going to be just as good,” he says, noting that of the 38 students currently enrolled in his two online sections at two campuses, only one student has such poor performance that he or she may not be able to pass the course. “This is about the same as what I saw last semester when I first personalized my course.”

Spear hopes to work with his institution’s administrators to use the foundation of this course as a model for other online courses at the college. “Most instructors here are adjuncts and have full-time jobs,” he states. “It would be nice for everyone to have something that’s ready to go so that all we have to manage are the questions we may get. I think this course, since it’s already personalized, would give them a great starting point.” The number of students impacted so far is small, but Spear is committed to continuing tracking, analyzing, and interpreting student data moving forward.

Spear recalls a particularly inspirational comment from a student: “I was dreading this class because of all the horror stories I have heard about statistics. However, the professor made it a really interesting and more easily understood class than I could have hoped for.” That was my goal, right there,” says Spear, “and without MyStatLab, it wouldn’t have been possible.”

Product Name **MyStatLab**

Course Name **Introduction to Statistics**

Course Format **Combination of hybrid and fully online**

Key Results

After Professor Hollister began to require MyStatLab's Companion Study Plan in her Introduction to Statistics course, students scored on average four percentage points, or five percent, higher on exams than students in the previous semester when the Study Plan was not assigned.

Submitted by

Diane Hollister, Professor

Course Materials

MyStatLab, Learning Catalytics, and *Essentials of Statistics*, Triola

Setting

Reading Area Community College (RACC) is an accredited, comprehensive, open-enrollment education institution. According to its website, 78 percent of RACC's students are enrolled part-time, with 53 percent identifying as white, 28 percent as Latino/Hispanic, and 13 percent as Black or African-American.

The Statistics course at RACC is a three-credit introduction to statistical concepts where students will gain an understanding of and ability to use graphs, frequency distributions, measures of central tendency and dispersion, probability, various distributions and their properties, testing hypotheses, approximation and Chi-square tests, regression, and correlation.

Challenges and Goals

RACC started using MyStatLab in 2007 and saw overall improvements in student achievement, but, Professor Diane Hollister recognized that many students continued to struggle. She found that students often lack some of the necessary prerequisite knowledge and many times exhibit poor study skills, so she started requiring students to use the Companion Study Plan in MyStatLab in January 2014, believing that doing so would increase student success.

Implementation

The statistics course at RACC is taught in a variety of ways. During the traditional semesters (fall and spring), Hollister's MyStatLab students are a blend of hybrid (face-to-face time with the instructor plus a MyStatLab online component) and fully online (no face-to-face time; all online via MyStatLab).

RACC also offers a three-week, intensive statistics boot camp in January and Hollister's summer sections are typically fully online. All students, no matter the course delivery method, receive the same resources via MyStatLab.

Hollister focuses her attention on providing as much support for her Statistics students as possible. She has created YouTube videos that show her students how to use StatCrunch and that review key course concepts. Also, in fall 2014, she began to provide students with a Learning Guide that outlines the course and allows space for students to write notes, explanations in their own words, etc. Finally, Hollister introduced Learning Catalytics into her classroom in fall 2014, which, she reports, has increased student activity in the classroom. "All of this is an attempt to provide them structure," says Hollister. "Believe it or not, even though this is a 200-level course, students still come to class sometimes without paper or anything to write with. These tools help to improve their study and learning skills."

Students start each chapter by working inside the homework assignment. Hollister only assigns one homework assignment per chapter, but she embeds media into it, and students can go in and out of the homework as often as they need throughout the time they spend covering the unit. Homework is due a couple days before the exam, all learning aids are always available to students, and they have four attempts on each problem.

Hollister reports that embedding the media into the assignments has cut down on the overall email from students and questions about concepts because she can track which topics tend to confuse students and insert media at that juncture to head off misconceptions and add further clarification. Discussion posts and course links also aim to address trouble areas and "help" documents are posted for each chapter.

After students complete the homework, or even during the time they are completing the homework assignment, they work in the Companion Study Plan (CSP). Students must achieve 80

“Student scores either improved significantly or stayed the same, and standard deviation of scores dropped in many cases significantly after implementing the Companion Study Plan.”— Professor Hollister

percent mastery on the concepts in the CSP before they can unlock the test for that unit.

Hollister has added mini assignments to the course recently as well. These assignments focus on a YouTube video with two or three problems assigned that are associated with that video. “That’s just a quick way to help students know what video from YouTube they should be focused on at that point of the chapter,” notes Hollister. “The students actually requested it.”

Tests are chunked by unit, and students can either take them on campus in the computer lab or remotely. Each test is timed at 90 minutes and must be taken in one sitting. The final exam is delivered via MyStatLab and is proctored on campus, timed, and password protected.

Some of the additional features in MyStatLab that Hollister utilizes, in an attempt to help provide structure for her students, are “Search/Email by Criteria,” the course calendar, the gradebook reporting dashboard, and StatCrunch.

“The new gradebook reporting dashboard has great visuals for things like item analysis, mastery information, and time on task with resulting score. I sometimes take a snapshot of the time on task visual and show it to my students during class. That’s when the light bulb goes on—they see the connection between working hard and getting a good grade.”

Assessments

65 percent	Tests (MyStatLab, nine unit tests timed at 90 minutes each, and the final exam, which is 25 percent of the category, delivered in MyStatLab and proctored)
20 percent	Homework (MyStatLab, one per unit/chapter)
15 percent	Projects (completed in MyStatLab using and analyzing data via StatCrunch)

Results and Data

When Hollister compared students’ scores on exams from fall 2013 when the Companion Study Plan was not assigned to fall 2014 when she did assign the Companion Study Plan, she saw a definite improvement in the fall 2014 scores. She reports, “Student scores either improved significantly or stayed the same, and standard deviation of scores dropped in many cases significantly.”

Further analysis of the data shows that students in the fall 2014 section scored, on average, four percentage points, or five percent, higher on exams ($M=86\%$, $SD=9\%$, $N=53$) than students in fall of 2013 ($M=82\%$, $SD=13\%$, $N=65$), $t(-1.94)=0.03$, $p<0.05$ (Figure 1). In this analysis, students without a final exam grade were removed (fall 2013 $n=11$, fall 2014 $n=4$).

There was also a strong positive correlation found between the average exam score and a student’s overall grade in fall of 2014, $r(53)=.86$, $p<.05$ (Figure 2). The data indicate a relationship between average exam score and a student’s overall grade—it should be noted that exam scores made up 65 percent of the final course grade when calculated, influencing this relationship.

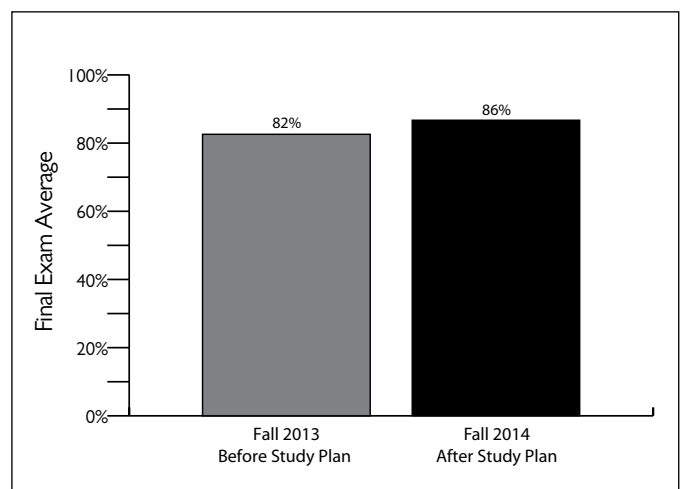


Figure 1. Comparison of Final Exam Average before Required Companion Study Plan (Fall 2013, $n=65$) and after (Fall 2014, $n=53$)

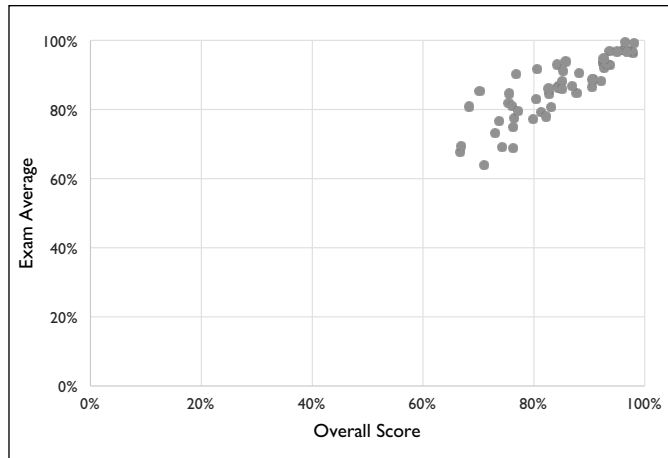


Figure 2. Overall Course Score and Exam Average, Fall 2014 ($n = 53$)

The Student Experience

According to Hollister, students seem to find the videos extremely helpful. She believes this is because they are very visual and specific to her students' needs. Hollister's students have told her that they like that she is the teacher in the video going over how to use StatCrunch or reminding them of what they talked about in class.

Hollister also reports that her students appear to enjoy Learning Catalytics. When Hollister decided to implement it, she told her students that she wanted to try out something new in class, and she wanted their feedback. She gave them the choice of rating the program "highly beneficial," "somewhat beneficial," or "I don't care to use it." When surveyed, every student who was present in class that day responded to the question, and the majority of responders found it "highly beneficial" and wanted to continue using it.

In an informal poll of her fall 2014 class, Hollister asked what resource they found most helpful in learning the material. Of those in attendance when the question was asked, all students responded and most responders initially replied that StatCrunch was the most helpful. She then asked the same question but gave answer options (study plan, videos, learning guide, etc.); 80 percent of the responders chose the YouTube videos, and 60 percent of the students found the Companion Study Plan helpful.

Hollister has noted that students get frustrated with the prerequisite requirement to master the objectives in the Companion Study Plan before being able to take the test, but she has found that explaining the rationale to her students helps ease their frustration. "I just tell them that they don't know what they don't know, and working to mastery in the CSP will get them a better grade on the exam."

Conclusion

Hollister is pleased with the way the Statistics course has performed, especially given all the changes and additions to the course. She plans to work on polishing the Learning Guide, trying to figure out how to best balance providing students with more support tools without overwhelming them. Specifically, she plans to include more guidance when it comes to StatCrunch, pointing students directly to certain applets within the program and leaving room for their observations.

Product Name **MyMathLab**

Course Name **Technical Math**

Course Format **Face-to-face**

Key Results Average ABC rates rose 11 percent after implementation of MyMathLab in spring 2011 and 31 percent after Contextual Projects were assigned within MyMathLab in fall 2013.

Submitted by

Matthew Hudock, Professor

Course materials

MyMathLab and *Mathematics for the Trades*, Carmen and Saunders

Setting

Part of the Alamo Colleges, St. Philip's College is a public, community college with open admission and a diverse student body. Sixty-three percent of students attend part time, 67 percent are employed either full- or part-time, and the average age is 27. It is also the only college to be federally designated as both a historically black college and a Hispanic-serving institution.

Challenges and Goals

Technical Math is designed to help students master the math skills necessary for their particular vocational and technical fields. Professor Matthew Hudock reports that his biggest challenge is getting students to see the relevance of the concepts they're learning to their fields. He hypothesized that adding MyMathLab into the curriculum would improve learning outcomes and motivate students to the point where they would sufficiently perform the calculations they need to succeed in their future technical trades.

Implementation

Class meetings include 25–50 minutes of both lecture and real-world problems involving measurement, ratios, proportions, percents, geometry, trigonometry, and algebra. Students use critical thinking in order to determine the appropriate process for solving problems.

Hudock adopted MyMathLab as soon as it became available for the textbook he uses. He assigns MyMathLab homework for each section, with a prerequisite that students first access

the multimedia features associated with each assignment. He encourages students to complete homework before class time, but the actual due dates are immediately before each test. Students have unlimited attempts at homework.

To promote student engagement in real-world applications and the development of critical-thinking skills, Hudock developed Contextual Projects in which students are assigned a scenario in their field of study. For example, "You have \$500 allotted for advertising and four media through which to do so. Choose how you should distribute your advertising budget."

Hudock uses MyMathLab's Custom Question Builder to assign Contextual Projects within the program. Students have two weeks to complete each project; projects are due one week after each test.

Assessments

70 percent	Tests (four, paper-and-pencil)
15 percent	MyMathLab homework
10 percent	MyMathLab Contextual Projects (four)
5 percent	In-class activities

Results and Data

Student performance has increased since implementation of MyMathLab. For the two semesters prior to implementation (fall 2008 and spring 2009), the average pass rate was 64 percent, the average retention rate was 82 percent, and the average ABC rate was 46 percent. After the addition of MyMathLab homework and averaged across five semesters, all three measurements increased: average pass rate to 65 percent, retention rate to 84 percent, and ABC rate to 51 percent. What's more, in the two semesters since Hudock assigned Contextual Projects, the average retention rate has increased an additional eight percentage points (to 92 percent), and the average ABC rate has increased another nine percentage points (to 60 percent) (Figures 1 and 2).

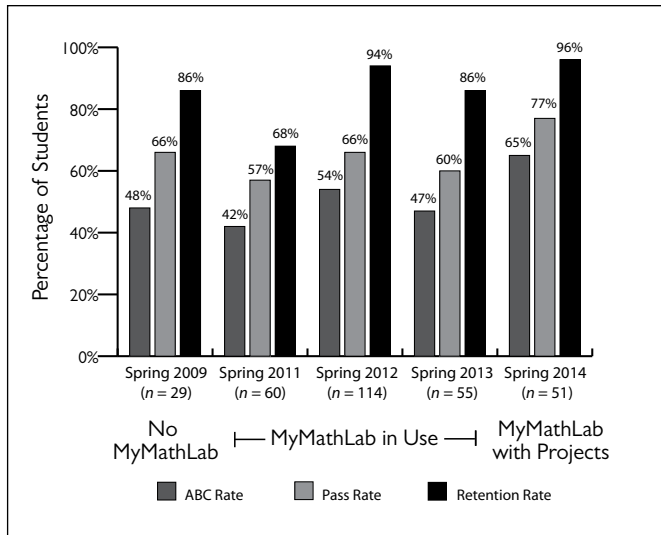


Figure 1. Student Outcomes before and after MyMathLab Implementation and Addition of Contextual Project, Spring 2009–Spring 2014 (No sections of the course were offered in spring 2010.)

In fall and spring 2013, Hudock’s course experienced a dip in student performance. He explains that a new placement assessment was adopted at the school that included more exemptions. As a result, students who do not have the necessary prerequisite knowledge are placed in the course. To help inform these new students, Hudock assigns a prerequisite MyMathLab assignment comprising 25 questions covering the skills and problems required at the beginning of the class.

The Student Experience

Hudock reports that his students appear more on task and more engaged since implementation of MyMathLab and the Contextual Projects. A spring 2014 student survey completed by 39 of 51 students (76 percent response rate) indicates that the majority of students recognize and value both aspects of the course (n = 39).

77% Somewhat or strongly agreed that Contextual Projects provide real-world learning experience.

74% Somewhat or strongly agreed that the projects helped them understand the concepts better.

Student comments include:

“The projects help me grasp concepts in real-world situations, which makes me want to learn the material.”

“The projects put math into real-world uses.”

“[The projects] offered me the chance to perceive math everywhere.”

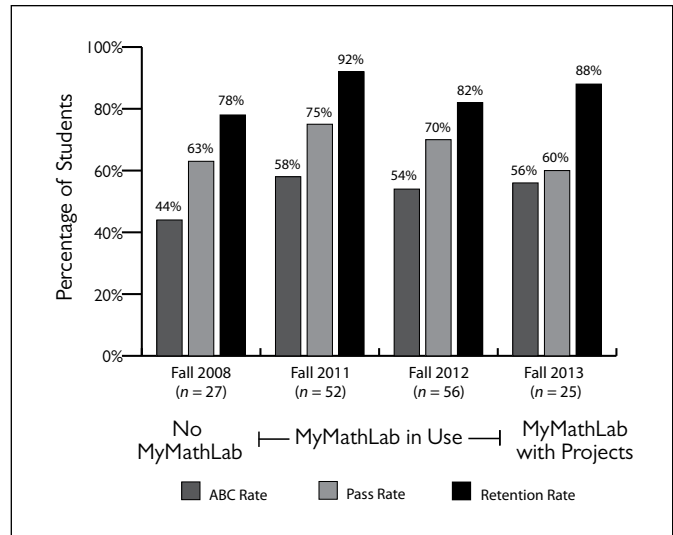


Figure 2. Student Outcomes before and after MyMathLab Implementation and Addition of Contextual Project, Fall 2008–Fall 2013 (No face-to-face sections were offered during fall 2009 or fall 2010.)

Of the students who responded to the survey, the majority appreciate MyMathLab and believe it helps them learn course material:

- 100%** Replied that the Help Me Solve This learning aid was very useful.
- 97%** Somewhat or strongly agreed that there are enough problems assigned in MyMathLab for them to learn course concepts.
- 95%** Somewhat or strongly agreed that MyMathLab scores are a good indication of understanding.
- 92%** Somewhat or strongly agreed that the instructor should continue requiring MyMathLab.
- 90%** Somewhat or strongly agreed that they would like to use MyMathLab in other courses.
- 82%** Somewhat or strongly agreed that they earned a higher grade because of MyMathLab.

Conclusion

Hudock is pleased with the results he’s seeing. “I’m so glad I’m using MyMathLab in this course. It saves time in class, which has enabled me to add a test; and now I can use the same materials in both my face-to-face and online sections.”

Hudock reports that without MyMathLab, in summer 2012 he would have had to cancel two sections—one online, the other face-to-face—because neither had enough students. “Thanks to MyMathLab we were able to offer the course and teach half the students face-to-face and the other half took it online.”

Product Name MyMathLab

Course Name College Algebra

Course Format Hybrid: One 100-minute lecture and three required lab hours per week

Key Results

In a hybrid redesign of the College Algebra course where populations are separated and taught in groups according to their goal for the course (terminal or prerequisite), average pass rates increased by 17.6 percent (10.6 percentage points)—from an average preredesign pass rate of 60.2 percent to a full implementation average pass rate of 70.8 percent.

Submitted by

Marianne Morea, Math Redesign Coordinator

Course materials

MyMathLab and *College Algebra*, Sullivan

Setting

SUNY College at Old Westbury, part of the State University of New York system, is a dynamic and diverse public liberal arts college on Long Island. The school serves more than 4,500 students in class sizes that average 22 students. The school's one-year retention rate for students entering in fall 2013 is 86 percent; four- and five-year graduation rates for students entering in 2009 were 22 percent and 34 percent, respectively.

College Algebra covers factoring polynomials, rational and algebraic expressions, exponents and radicals, linear and quadratic equations, complex numbers, inequalities, functions and their graphs, and systems of equations.

Challenges and Goals

Faculty at SUNY Old Westbury noticed that two groups of students took the College Algebra course: those using it as a prerequisite for other math and science courses, and those using it as a terminal course to fulfill their degrees. Students taking College Algebra as a terminal course typically did not pass it as quickly or at as high a rate as the other students. As a result, instructors were unable to cover as many topics as necessary for those who needed it as a prerequisite. Morea and colleagues hypothesized that by separating the two populations, the course would be strengthened, and student performance would improve.

Implementation

MyMathLab was first implemented at SUNY Old Westbury in 2007 when the college's provost, formerly of Louisiana State University, recommended the program based on that school's success with it.

Marianne Morea, redesign coordinator, and her colleagues adopted MyMathLab and the basic LSU implementation model with changes to accommodate the specific needs of their students. For example, unlike at LSU, SUNY Old Westbury offers students partial credit on lab attendance.

On the first day of class, students are divided into two groups of between 25 and 40 students each: those taking the course as a terminal course (proficiency) and those taking it as a prerequisite for other math or science courses (prereq). Each group meets separately under the same instructor.

Students who score 80 percent or more on the first test are exempt from the lab requirement. If their scores drop as the semester continues, they may be required again to attend lab.

Homework, quizzes, and tests are delivered via MyMathLab. While students may complete homework and quizzes from anywhere, tests and the final exam are taken in the school's math lab. They are also scheduled, proctored, and password protected with blocked access using MyMathLab's browser lockdown feature.

All assessments have fixed due dates. Homework assignments that are submitted up to a week late incur a 10 percent deduction. There are 10 to 11 quizzes per semester; the eight highest scores are counted toward the final grade and no late submissions are allowed.

Students are offered unlimited attempts on homework and three attempts for each quiz. They have no access to learning aids during quizzes, and only the highest score is counted.

After implementation, pass rates in the redesigned courses rose from 68.5 to 72.2 in the fall and 60.8 percent to 67.1 in the spring.

In addition, students must complete a review homework before every test. To promote that the review homework is taken seriously, each student’s review scores are tallied and the average score is counted as a test.

Assessments

- 40 percent MyMathLab test grades (five)
(Three of these are proctored and password protected tests; two are review assignments. Students may drop one test grade if they have fewer than three absences from lecture.)
- 30 percent MyMathLab final
(Proctored, password protected)
- 10 percent MyMathLab quizzes
- 10 percent MyMathLab homework
- 10 percent Lab attendance

Results and Data

A chi-square test of independence was performed to examine the relation between fall pass and fail rates pre- (AY 02/03–FY 08/09) and post- (AY 08/09–AY 12/13) redesign. The relation between these variables was significant, $\chi^2 (1, N=3,803) = 6.16, p < .05$. Academic pass rates increased from 68.5 percent prior to redesign to 72.2 percent after redesign (Figure 1). Grades of C or better were considered passing for all semesters included in the data analyzed for this report.

A chi-square test of independence was performed to examine the relation between spring pass and fail rates and pre- (AY 02/03–FY 08/09) and post- (AY 08/09–AY 12/13) redesign. The relation between these variables was significant, $\chi^2 (1, N=2,989) = 12.69, p < .001$. Academic pass rates increased from 60.8 percent prior to redesign to 67.1 percent after redesign (Figure 2).

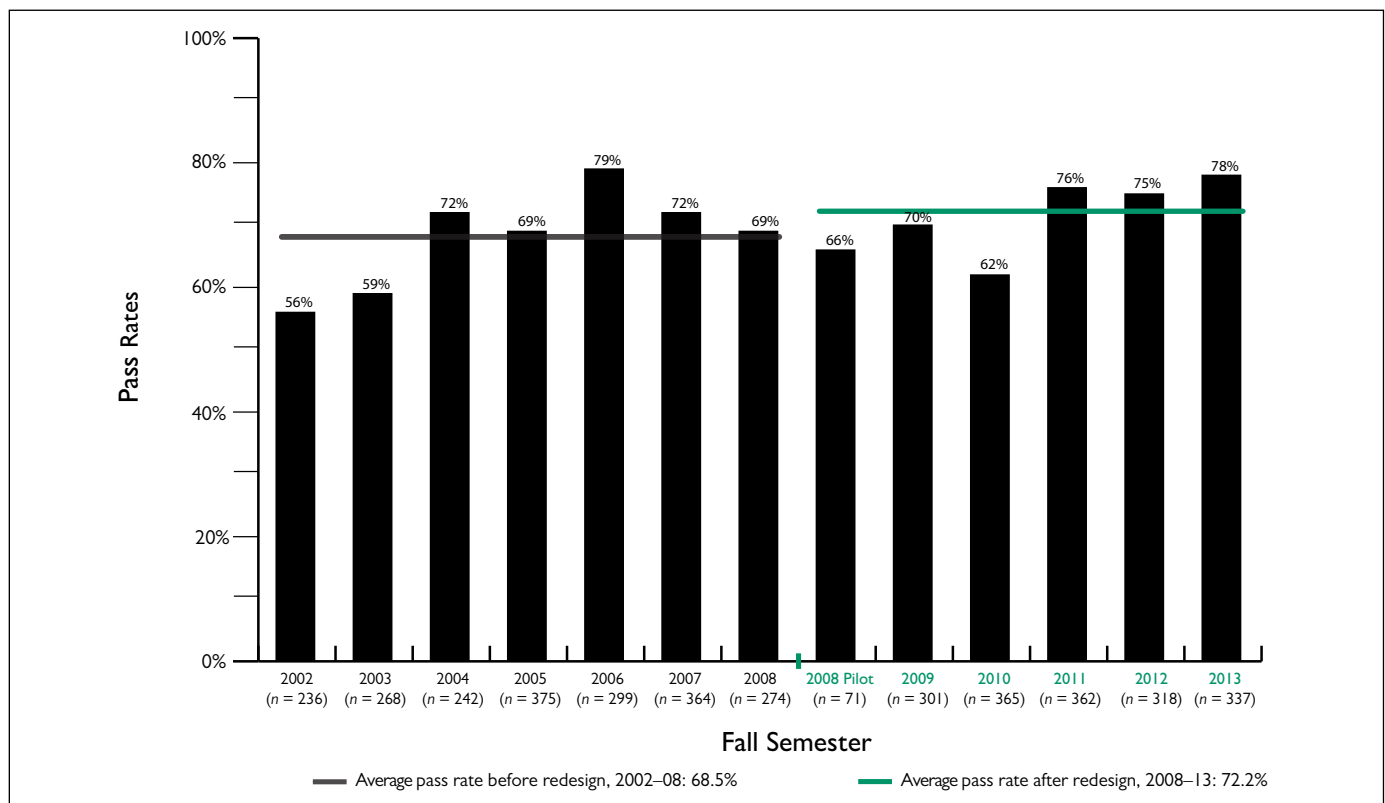


Figure 1. College Algebra Pre- and Post-Redesign Fall Pass Rates, 2002–13 (n = 3,803)

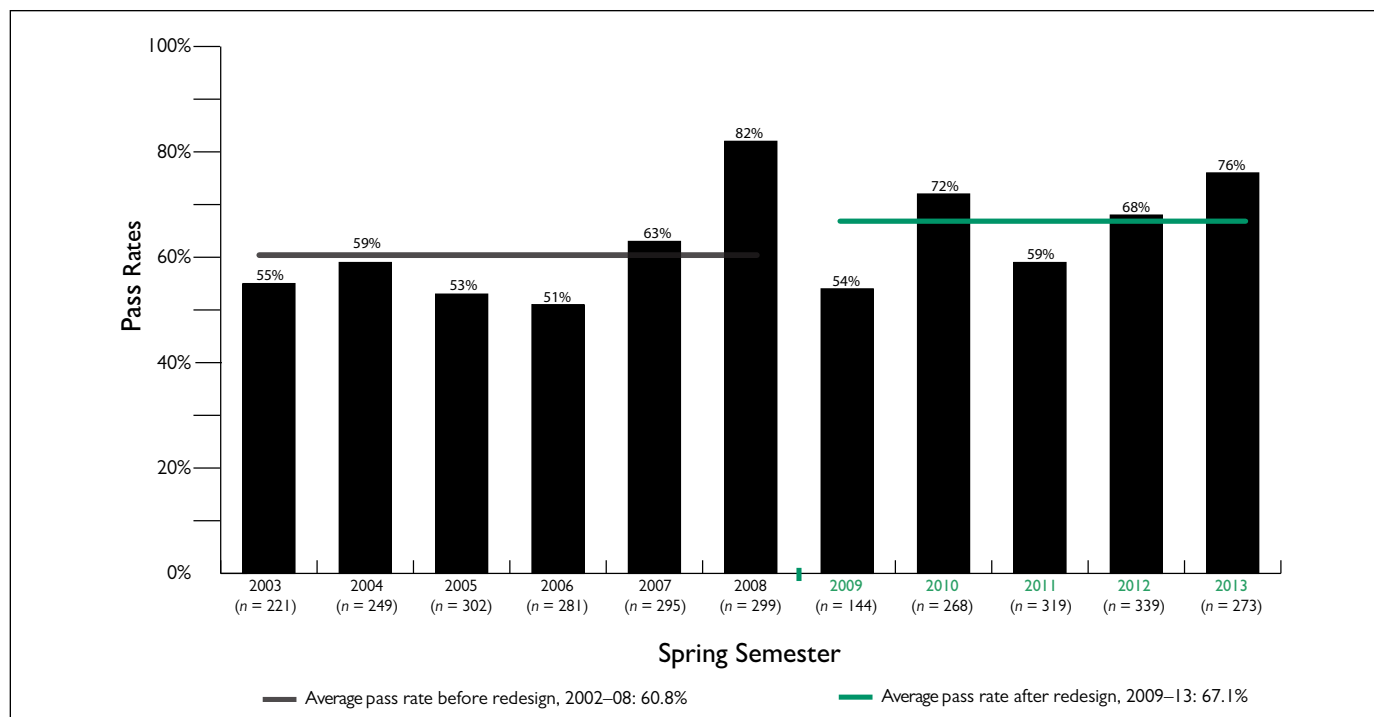


Figure 2. College Algebra Pre- and Post-Redesign Spring Pass Rates, 2002–13 (n = 2,989)

Retention rates remained streaky in fall semesters (88.6 percent) before and after redesign. A chi-square test of independence was performed to examine the relation between spring retention and withdraw rates pre- (AY 02/03–FY 08/09) and post- (AY 08/09–AY 12/13) redesign. The relation between these variables was significant, $X^2(1, N = 2,989) = 4.10, p < .05$. Academic retention rates increased from 82 percent prior to redesign to 84 percent after redesign.

The Student Experience

Results from a student survey designed and conducted by Morea in the redesigned course indicate that responders appreciate the redesign format. Morea maintains that the majority of respondents agree that they learned more from working independently with the support of MyMathLab and tutors than from listening to a lecture. Morea also reports that students acknowledged in the survey that they like attending lecture one day per week and working on homework when it is convenient for them.

In addition, Morea reports that most respondents believe that they performed better in the redesigned format than they would have in a traditional classroom, and more than 70 percent of those responding felt they were prepared to progress

to the next-level course. Although Morea recalls students complaining about the quantity of work and lab hours required of them, she reports that 55 percent of responders agreed that they needed to complete that amount of work in order to master the material. According to Morea, students love the software and the support they now receive, “Before they had to search us out for help. They know we’re here now.”

Conclusion

Morea and her colleagues are extremely happy with both MyMathLab and their redesigned course, which they believe is no longer weakened by the need to water down some topics or not cover others at all. “When I originally agreed to do the redesign, I wasn’t convinced it would work,” she says. “Now I wouldn’t go back.”

Morea feels every student receives the attention and teaching that he or she needs and, as a result, average pass and retention rates have increased. The redesign also has improved the reputation of the math department—other departments on campus notice its success and appreciate what they’ve created. “The school supports our program so much,” she says, “that they’ve put their money where their mouth is and renovated the campus library to include a larger computer lab.”

Product Name **MyMathLab**

Course Name **Calculus for Business**

Course Format **Hybrid: 50 percent face-to-face lecture, 50 percent online**

Key Results

In this hybrid redesign of a Business Calculus course where the instructor cut class time by 50 percent and utilized lecture videos to supplement instruction outside of class and MyMathLab to assess student learning, final course grades remained constant.

Submitted by

Darin Kapanjie, Assistant Professor, Managing Director of Fox Online & Digital Learning, Academic Director of Online MBA and BBA Programs

Course materials

MyMathLab and *Calculus and its Applications*, Bittinger

Setting

Temple University is a public, four-year research university and a national leader in education, research, and healthcare. With a 64 percent admissions rate, Temple is a selective university. Twenty percent of incoming freshmen graduated in the top 10 percent of their high school class, the average combined SAT score is 1129, and the average ACT composite score is 24. Temple boasts a 14:1 student-to-teacher ratio, and has a 66 percent six-year graduation rate.

The Fox School of Business at Temple it is the largest, most comprehensive business school in the greater Philadelphia region and boasts a 59 percent admission rate, 1182 average SAT, and 3.51 high school GPA for incoming freshmen.

In fall 2012, Assistant Professor Darin Kapanjie began to offer his Business Calculus course to students in a hybrid format: 50 percent of the course spent in class, face to face, and 50 percent spent online watching recorded lectures and working in MyMathLab. Kapanjie's syllabus states, "The course is designed to give students 24/7 on-demand access to content, assignments, and lectures. Being successful in this course puts a great deal of responsibility in the students' hands."

Challenges and Goals

Kapanjie has been using MyMathLab since 2002; however, he wanted his students to take more ownership of their learning and more responsibility for their work inside and outside of class. Kapanjie hypothesized that by moving to a hybrid format where students spend 50 percent of their time in lecture and

50 percent of their time working online, students would be more responsible for their learning while still maintaining their performance as well as having more flexibility in their schedules.

Implementation

The course is comprised of two components: prerecorded lectures designed and recorded specifically for the business calculus course, and live instruction/collaboration delivered in the auditorium.

Students start each section with a 10-minute video, created by Kapanjie, that discusses the particular topic at hand. After watching the video, students complete a post-recording quiz, where they are allowed one attempt. At that point, they can move on to the homework. Kapanjie utilizes the prerequisites feature in MyMathLab in order to require students to attempt the post-recording quiz before moving on to the homework assignment.

Kapanjie assigns one homework per class day (available after class); students have unlimited attempts, and it is due six days after it is assigned. Students are able to use the View an Example and Ask My Instructor learning aids in the problems; although those are removed sporadically later in the semester to ensure students aren't using them as a crutch.

Because the Business Calculus course covers six chapters, students take an exam every two chapters. Halfway through the "unit" of two chapters, there is a quiz that students complete in MyMathLab. They are allowed one attempt on the timed, one-hour chapter quiz that has 10–15 questions and is not proctored, meaning students can take it remotely.

In his live, face-to-face lectures, Kapanjie utilizes Poll Everywhere to encourage classroom participation. He also encourages students to work assigned problems out of the book to prepare better for exams, but those problems are not graded.

“Students will rise to whatever bar you set for them. I expect them to work hard outside of the classroom to prepare for the daily grind of this rigorous course.” — Professor Kapanjie

Assessments

- 50 percent Three exams (16.67 percent each)
- 25 percent Final exam
- 10 percent Three MyMathLab online chapter quizzes (3.33 percent each)
- 10 percent MyMathLab online homework
- 2.5 percent MyMathLab post-recording quizzes
- 2.5 percent Poll Everywhere
- 0 percent Book homework

Results and Data

Of the four years of data analyzed, each semester showed a strong positive correlation between online homework grades and average exam grades with the strongest of the four semesters occurring after the course transformation in 2014, $r(245) = .74, p < .01$ (Figure 1). In other words, a relationship was found between online homework assignment scores and average exam scores. As one increased, it was observed that the other increased as well.

In addition, a one-way analysis of variance was conducted on the four semesters of course grades to determine if there was any difference before and after the course transformation. The

ANOVA revealed no significant difference, $F(3,971) = .575$, not significant. While course grades did slightly increase, the increase was not significant (Figure 2). Kapanjie believes that the fact that course grades remained at least constant is a testament to students taking on the learning initiative outside of the classroom.

The Student Experience

Overwhelmingly, Kapanjie’s students appreciate the format of the course and believe MyMathLab helps them learn the course material. In a survey completed by 64 of 246 students in fall 2014, 96.9 percent of respondents “somewhat” or “strongly” agreed that MyMathLab allowed them enough practice to understand the concepts. The following are the percentage of survey responders who “somewhat” or “strongly” agreed to the statements.

- 98.4%** I would recommend my instructor continue having students use MyMathLab.
- 96.8%** I wish I could use MyMathLab like this in other courses.
- 85.5%** I got a better grade in this class because of the work I did in MyMathLab.

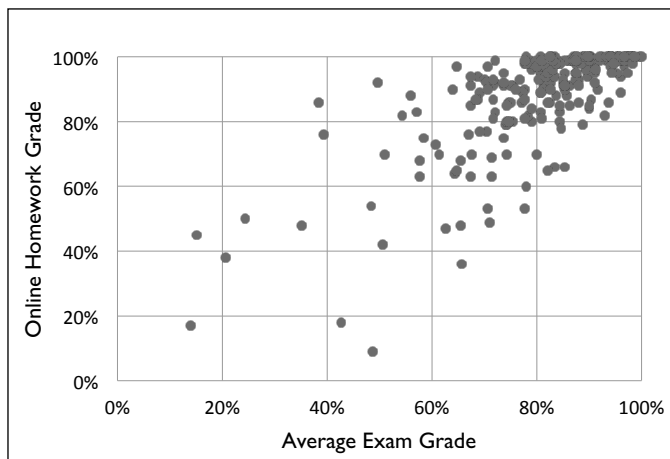


Figure 1. Correlation between Average Exam Grade and Online Homework Grade, Fall 2014 (n = 246)

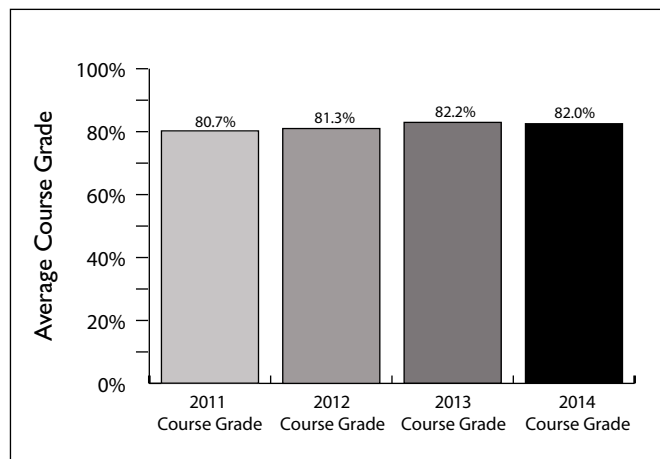


Figure 2. Average Final Course Grade before Redesign (2011 n = 240, 2012 n = 243, 2013 n = 244) and After (2014 n = 246)

In addition to valuing MyMathLab, survey responders also found the course format to be very helpful. Following are the percentage of survey responders who “somewhat” or “strongly” agreed to the statements below.

- 98.4%** The format of the course let me take responsibility for my learning.
- 98.4%** The format of the course provided the flexibility I needed.
- 96.9%** I like the format of the course.
- 95.3%** The amount of time we spent in lecture was appropriate.
- 93.7%** I would recommend this format to other instructors for other courses.

Prerecorded lectures were just as accepted and appreciated by the students:

- 95.3%** “Somewhat” or “strongly” agree with the statement, “I like the prerecorded lectures.”
- 95.3%** “Somewhat” or “strongly” agree with the statement, “The prerecorded lectures provide a good introduction to the concept.”
- 95.2%** “Somewhat” or “strongly” agree with the statement, “Watching the prerecorded lectures helped me understand the concepts better.”

Conclusion

In conclusion, student performance and survey data collected to date suggest the course is producing what Kapanjie believes are acceptable results. The fact that students can spend half the time they were spending in the classroom and still maintain their performance is a testament to Kapanjie’s faith in his students’ abilities and work ethic outside of class: “Students will rise to whatever bar you set for them,” he states. “I expect them to work hard outside of the classroom to prepare for the daily grind of this rigorous course.” Moving forward, Kapanjie plans to rely more heavily on the video and MyMathLab components to build students’ basic understanding of concepts. Then, during the live class sessions his strategy is to push them further by integrating more challenging application problems.

Conclusion and Resources

HELPFUL PEARSON LINKS

Below is a list of links developed to inspire, support, promote conversation among educators and to ensure that the latest and most-effective practices are shared across the industry. We hope you find them useful and urge you to share them with colleagues and others committed to improving the teaching and learning experience.

Results Library

www.pearsonmylabandmastering.com/results

[16 Proven Ways to Help Your Course Redesign Succeed: Best practices from developmental math redesigns using MyMathLab in a lab-based setting at community colleges](http://www.pearsonmylabandmastering.com/northamerica/results/files/Math_courseredesign_WP_Mar2013-24.pdf)

www.pearsonmylabandmastering.com/northamerica/results/files/Math_courseredesign_WP_Mar2013-24.pdf

Course Redesign Community

<http://community.pearson.com/course-redesign/>

Faculty Advisor Network

<http://community.pearson.com/fan>

Math Instructor Exchange

www.instructorexchange.com/

Planning Toolkit for Math & Stats

https://media.pearsoncmg.com/long/CEPM.selfpaced/.Curriculum/IPT/PT_Math.pdf

Teaching and Learning Blog

<http://www.pearsoned.com/blog/higher-education-2/>

MyLab & Mastering: 10 Best Practices

www.pearsonmylabandmastering.com/northamerica/educators/results/

More than simply successful implementations, the courses, programs, and initiatives described on the previous pages are victories. Behind the successful outcomes—in the forms of improved final exam grades, increased persistence, success in subsequent courses, college readiness, and other learning gains—are students who have become better equipped to pursue their academic goals and achieve their life dreams.

An Ongoing Process

We applaud the institutions included herein for their efforts and determination. But those efforts are not over: a successful technology implementation is an ongoing process, ever evolving with the emergence of new and improved pedagogy, the entry of each unique cohort of students, and the increased amounts of information gleaned via the long-term tracking and measuring of student data.

Pearson's Faculty Advisor Network (FAN) is available to help you improve the teaching and learning experience in your courses. Visit the FAN site to meet and engage with a community of educators who are eager to share advice, tips, and best practices related to MyLab & Mastering products. Join the network by visiting the site at <http://community.pearson.com/fan>.

The Pearson Family of Solutions

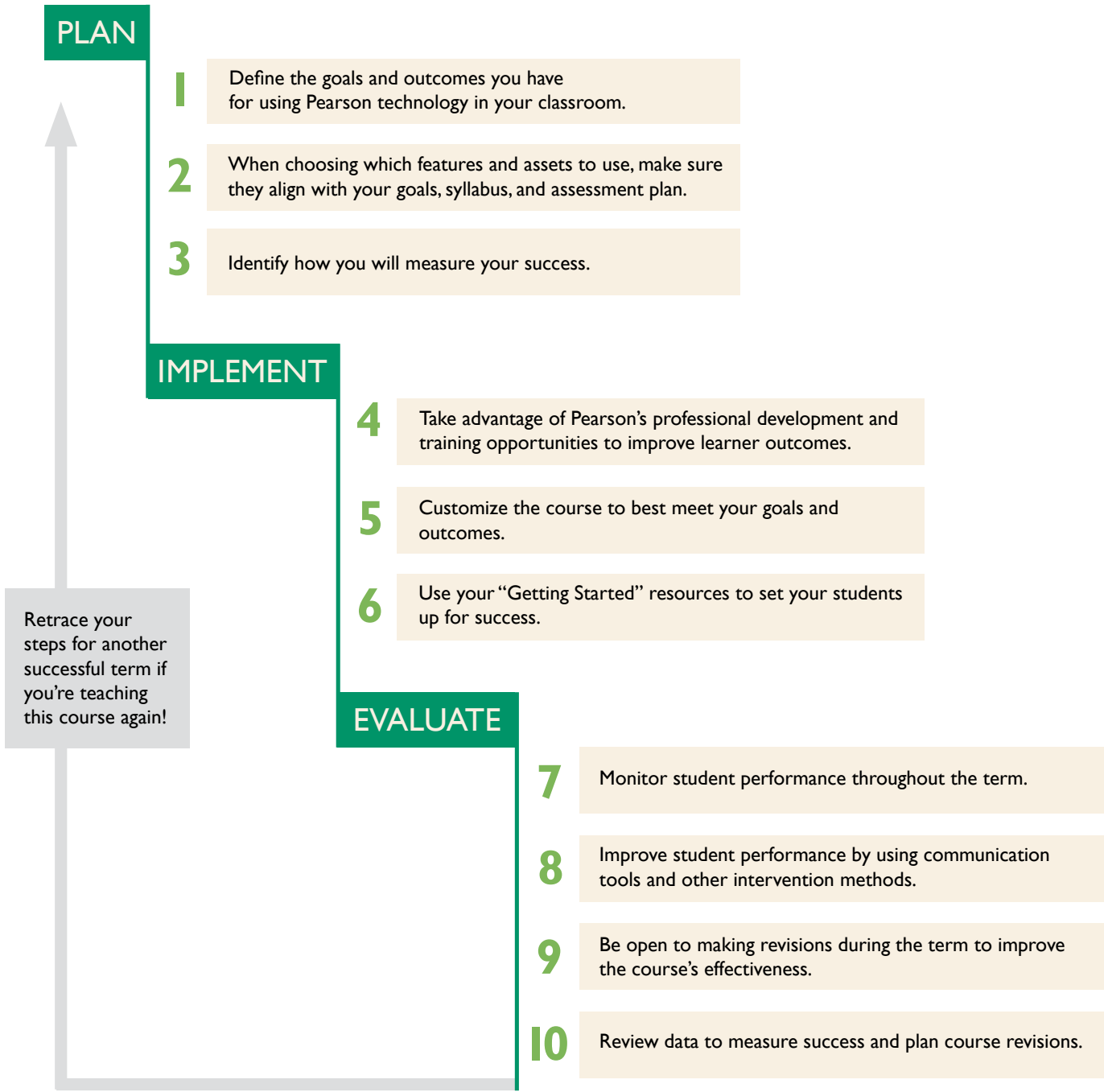
Pearson offers solutions for all kinds of educational needs, for all types of courses, and for all of the ways those courses are taught and delivered. Combined with one of the many proven-successful best practices, the possible configurations of an effective MyLab & Mastering implementation are limitless. Let us help you:

- **Increase achievement.** Instant access to reliable data can help in the development of personalized learning, assessment, and instruction and can provide a blueprint for faculty and institutional effectiveness.
- **Expand access.** From digital course materials and real-time assessments to fully online courses, MyLab & Mastering learning solutions are more flexible, more powerful, and more accessible than ever before.
- **Enable affordability.** Innovative technology offers the best opportunity to deliver personalized, scalable, and engaging solutions that drive results up and drive costs down.

We look forward to hearing about your achievements and to including your experience in the next MyLab & Mastering report. To tell us about your success, contact Traci Simons, senior efficacy results manager, at traci.simons@pearson.com.

TEN STEPS

TO A SUCCESSFUL IMPLEMENTATION



MyMathLab[®] • MyStatLab[™] • MyLabsPlus

www.pearsonmylabandmastering.com