MyLab Math with MyLabs Plus educator study examines workspace assignment impact in Intermediate Algebra at University of South Florida

School Name
University of South Florida, Tampa, FL

Course name
Intermediate Algebra

Course format
Hybrid

Course materials
MyLab Math in MyLabs Plus for
Intermediate Algebra, 7th Edition by
Martin-Gay

Timeframe
Spring 2017

Submitted by
Ruthmae Sears, Assistant Professor and
Course Coordinator

Results reported by
Julianne Labbiento, Pearson Customer
Outcomes Analytics Manager

Key Findings

- Strong correlations exist between workspace assignment averages and both final exam scores and final course scores.

- On average, students who passed the course scored 40 percentage points higher on workspace assignments than students who did not pass.

- Faculty found that by reviewing and analyzing the student responses on workspace, they are able to tailor the timing and depth of rigor in the course to best benefit the students.

Setting

The University of South Florida in Tampa is one of three members of the USF System and is accredited by the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC). USF has a total campus enrollment of approximately 42,000 students including over 30,000 undergraduates, 9,000 graduates, and 650 Doctor of Medicine candidates, as well as more than 1,700 non-degree-seeking students. Students are a diverse group, representing every state and U.S. territory. In addition, international students make up seven percent of the total student population, representing more than 150 countries around the world. New freshman for the Fall 2015 semester had an average high school GPA of 4.08, and average SAT and ACT scores of 1223 and 28, respectively. Over half of new freshman graduated in the top 20 percent of their class. (http://www.usf.edu/about-usf/facts.aspx)

About the Course

Intermediate Algebra (MAT1033) at USF is intended to prepare students for the college-level algebra courses needed to meet the state requirements for mathematics competencies. The course is expected to adequately prepare the student for MAC1105 (College Algebra), MGF1106 (Finite Mathematics), or MGF1107 (Liberal Arts Mathematics), and provide a strong algebra foundation for higher-level mathematics courses. Topics include: factoring, algebraic fractions, radicals and rational exponents, real and complex numbers, quadratic equations, rational equations, linear equations and inequalities in two variables and their graphs, systems of linear equations and inequalities, an introduction to functions, and applications on all topics covered. The course is worth three credits and generally meets three times per week for 50 minutes each class period. There is also a two-hour weekly lab requirement.

Challenges and Goals

Dr. Ruthmae Sears is assistant professor and course coordinator of the Intermediate Algebra course at USF. She recalls that, prior to implementation of workspace, she and her faculty were convinced that there existed a large number of students simply memorizing questions versus understanding them. "We needed to see how the students were thinking," she says. The team felt that students answering problems incorrectly could be making any combination of three types of mistakes: mathematical, symbolic, or syntactical. When MyLabTMMath is used traditionally for homework and quizzes, instructors are only able to see whether a student is correct or not. Sears hoped that the inclusion of workspace, with its ability to record a student's steps to the solution or answer for a problem, would allow instructors to isolate a student's weaknesses and address their mathematical, symbolic, or syntactical mistakes. By identifying, isolating, and focusing on the true issues creating barriers to success for the students, faculty hoped to show significant overall success in the course. Sears also mentions that, prior to the implementation of workspace, instructors who wished to see their students' work were often overwhelmed with a mound of papers to grade individually. Faculty surmised that workspace would alleviate that load, while still allowing them to see exactly how their students were approaching problems.

Implementation

Any number of teaching/learning techniques are used in the classroom, and this varies by instructor. Activities may include lectures, discussions, cooperative learning activities, computer work online in MyLab, question-and-answer sessions, and student demonstrations or explanations. Assignments and readings supplement classroom activities. Instructions for completing each assignment are provided during class sessions and on the course website (within Canvas) on MyLab. Students are expected to be prepared to present results and solutions to peers in group and full class settings. A strong emphasis on creating a positive work environment and attitude is evident throughout the course. Though a set-pacing schedule is presented, students are encouraged to work ahead as much as possible and are similarly counseled on the dangers of falling behind. Instructors share student success best practices including: schedule a time to study, don't fall behind, choose a quiet area to study and limit interruptions, self-motivate by reminding yourself of personal goals, work hard, seek help as needed, and be proactive.

Student knowledge is assessed using a variety of tools in MyLab. All assignments must be completed by their designated due dates and may not be revised for resubmission after the due date. Students

are strongly recommended to arrange to meet with instructors in advance of due dates to receive feedback and additional guidance regarding progress on submissions.

Graded online homework, workspace assignments, and quizzes—all delivered in MyLab—are collectively worth 20 percent of a student's final course grade. Students in the course are expected to have access to a computer, as most of the assignments are completed outside of the classroom. In a voluntary student survey (88 percent response rate), students rated their comfort level with technology at 8.6 on a 10-point scale. In the same study, 86 percent of responding students indicated that they used either a laptop or desktop often or very often for classwork requiring MyLab, with 61 percent reporting that they never used a smartphone to work and 63 percent saying that they never used a tablet for work in the course.

MyLab homework assignments can be repeated an unlimited number of times prior to their due dates. Students showed an appreciation for the learning aids in the homework, with one saying, "The biggest benefit, for me, was the View an Example tab. When I was stuck on a problem, I was able to click that tab and it would show me an example of a similar problem to help guide me through everything." The highest score on a homework assignment is used to calculate the course average, with a 15 percent penalty for completing a homework assignment after it is due. Though only final answers are required in MyLab, students are expected to maintain a math notebook for both class notes and to show work for MyLab homework assignments and have it with them during class for reference.

Associated with the online homework assignments are weekly workspace assignments and online quizzes. Workspace assignments differ from traditional MyLab homework assignments in that workspace is designed to capture a student's work within the exercise, thereby providing a visual image of the student's thought process as he or she works through the exercise. Sears notes that the ability to see a student's work in this way is crucial to identifying what type of mistake—mathematical, symbolic, or syntactical—is being made. She says that it can even reveal potentially problematic issues on questions where students gave the correct answer, relating that for some students, "the concept is there, but it is a fragile conceptualization." Students may do workspace assignments twice, with the higher of the two scores counting towards their final grade.

The work for each attempt is available for viewing by faculty, which Sears relates is of great value, as it allows instructors to see a student's progression in learning between each attempt. One student commented, "Workspace is very helpful. It will give you a hint if you need or complete the next step to help you get on the right track. It also has a video feature that makes it easier to learn how to solve the question." An additional benefit of the incorporation of workspace, according to Sears, is that faculty have begun to use student responses on workspace questions to facilitate discussion on how and where to add more rigor in their classroom instruction so that it most benefits students. MyLab quizzes, which are expected to be completed outside of class, can be taken up to three times each, with the highest score used to calculate the course average for that particular quiz. Each week, there is also an in-class quiz taking at most 18 minutes of a 50-minute class period. Questions on the in-class quizzes are similar to the MyLab practice quizzes. Students who arrive late to class are not eligible for additional time.

Participation plays a heavy role in the course, contributing 10 percent towards a student's final course grade. To earn their in-class participation grade each week, students use a remote wireless responder to answer questions posed by their instructor regarding content that will be studied that

week. The responses are used as a means to both count attendance and to instantly gauge the students' skillsets and preparedness relative to the week's agenda, allowing the instructor to adjust delivery of the scheduled content based on specific student needs.

Also included in the participation grade is lab attendance. Students are required to spend a minimum of two hours each week in the SMART Lab to work on MyLab assignments, quizzes, study plans, and get tutoring in MAT1033. The SMART Lab is staffed with tutors, teaching assistants, and instructors. Students are expected to be working on Intermediate Algebra activities, such as homework, workspace, quizzes, practice tests, MyLab study plan, or watching course-related multimedia content. Students found to be spending time on other work earn zero participation points for the day.

The SMART Lab is also used for testing for the course. Four MyLab tests are given in the SMART Lab, with two testing opportunities for each of the four tests. The first attempt is in a multiple-choice format, and the second attempt is a mixed-response format that is comprised of both multiple-choice and free-response questions. Students may take either or both formats. If a student does choose to take both formats, then the higher grade counts as that test score.
A two-hour cumulative final exam is also given in MyLab. All questions are multiple choice, and students have only one attempt. The final exam score is used to replace the lowest test score in the final grade calculation. Though tests and the final exam are delivered in MyLab, students are required to show work in blue books and submit them at the completion of each of these assessments.

Students are offered the opportunity to earn extra credit in the course by completing study plan questions. A personalized study plan is continuously updating as each student works on course material in MyLab. Consistent effort on the personalized study plan may count as an extra credit assignment. The amount of effort needed to be given to the study plan to obtain extra credit is based on the decision of the instructor and/or the coordinator of the course.

Assessments

At the end of the semester, the two lowest homework scores, the two lowest workspace scores, and the two lowest MyLab quiz scores are dropped prior to final grade calculation. Each student's final grade is then calculated based on the following:

- 70%   MyLab tests and final exam (cumulative)
- 10%   MyLab homework assignments and workspace assignments
- 10%   MyLab quiz average
- 10%   Participation average

Final letter grades are assigned using the following scale:

A+	97–100%	B+	87–89%	C+	77–79%	D	63–66%
A	93–96%	B	83–86%	C	70–76%	D-	60–62%
A-	90–92%	B-	80–82%	C-	67–75%	F	0–59%

Students who complete their personalized study plan can earn up to a two percentage-point increase in their final grade. This extra credit is given at the discretion of the instructor. Any student who obtains more than 10 absences will be subject to a letter grade reduction for their final course grade (ie. A grade of B+ would be reduced to a B, A- reduced to a B+, etc.)

Results and Data

Sears reports that she observed a slight increase in pass rates in Fall 2016 outcomes the first semester that workspace was incorporated, but she didn't formally analyze results at that time. She and her team feel that the inclusion of workspace assignments as a requirement in the course has had great impact. Students noted that, "Workspace is very helpful because it gives you step by step feedback for each problem," and, "it helps you learn how to do the correct steps for any given problem."

Data show strong correlations between the workspace assignments in MyLab and a student's final exam score, as well as workspace assignments and a student's final overall score for the course. A correlation measures the strength of a relationship between two variables, where r is the correlation coefficient. The closer a positive r value is to 1.0, the stronger the correlation. The corresponding p-value measures the statistical significance or strength of the correlation, where a p-value <0.001 shows the existence of a positive correlation between these two variables. Note that correlation does not imply causation; it is simply a measure of the strength of the relationship. Figure 1 displays the correlation between workspace assignments and final exam scores, $r=0.61$, $p<0.001$, while Figure 2 illustrated the correlation between workspace assignments and final course scores, $r=0.74$, $p<0.001$. Both results are statistically significant. Workspace assignments and homework assignments combined to contribute ten percent towards students' final grades in the course.

Correlation between workspace assignment averages and final exam scores
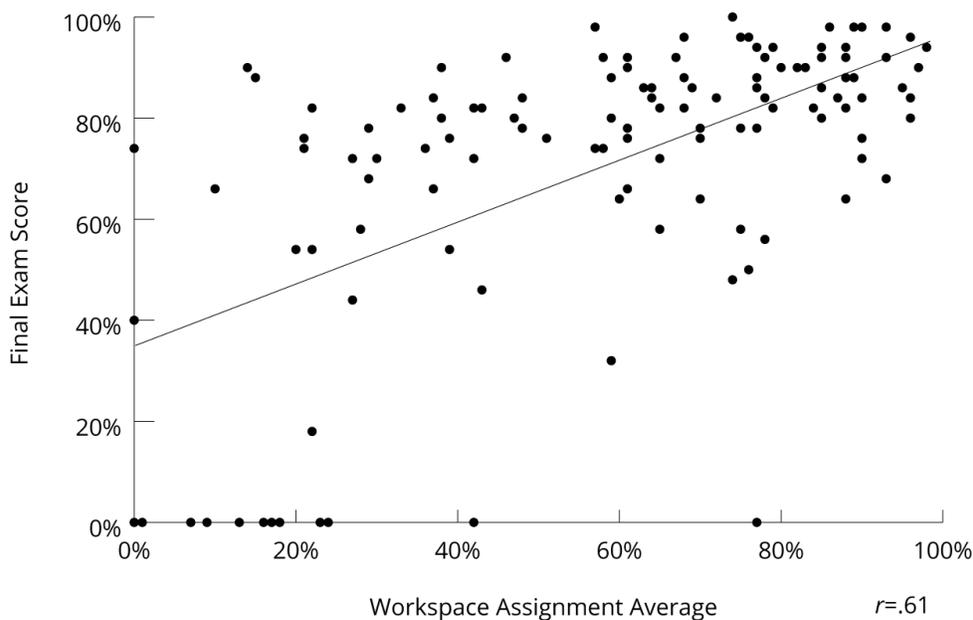

Figure 1. Correlation between Workspace Assignment Averages and Final Exam Scores (n=128)

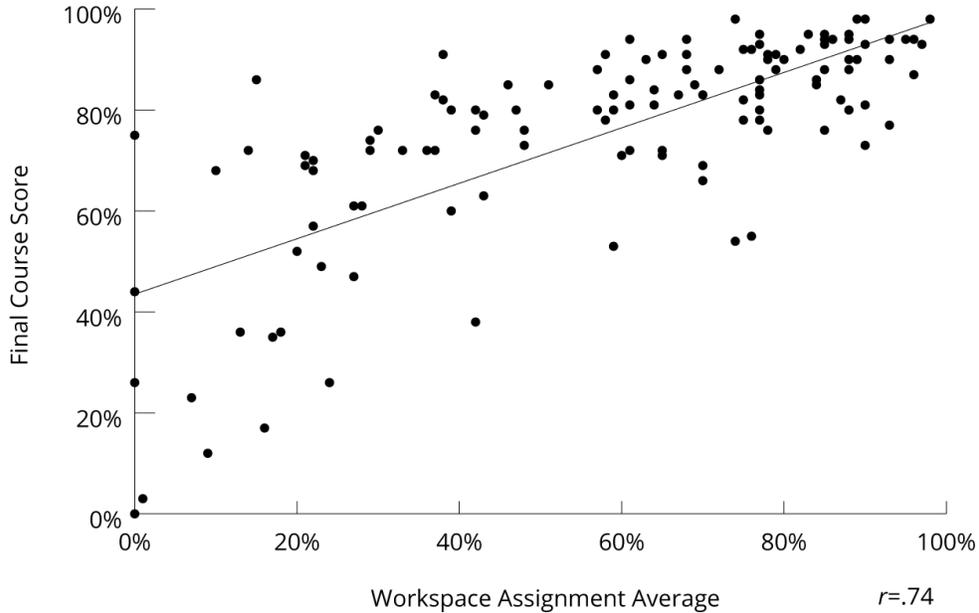## Correlation between workspace assignment averages and final course scores

Figure 2. Correlation between Workspace Assignment Averages and Final Course Scores (n=128)

According to a voluntary student survey (88 percent response rate), students noted "I found the Lecture videos [in workspace] to be very helpful because it taught me how to solve the problem the same way my teacher taught it" and "[workspace] helped me work through my problems step-by-step." Analysis of the data show that, on average, students who passed the course scored 40 percentage points higher on workspace assignments than students who did not pass (figure 3). This result is significant with $p<0.001$.

Overall workspace assignment averages for students passing or failing the course
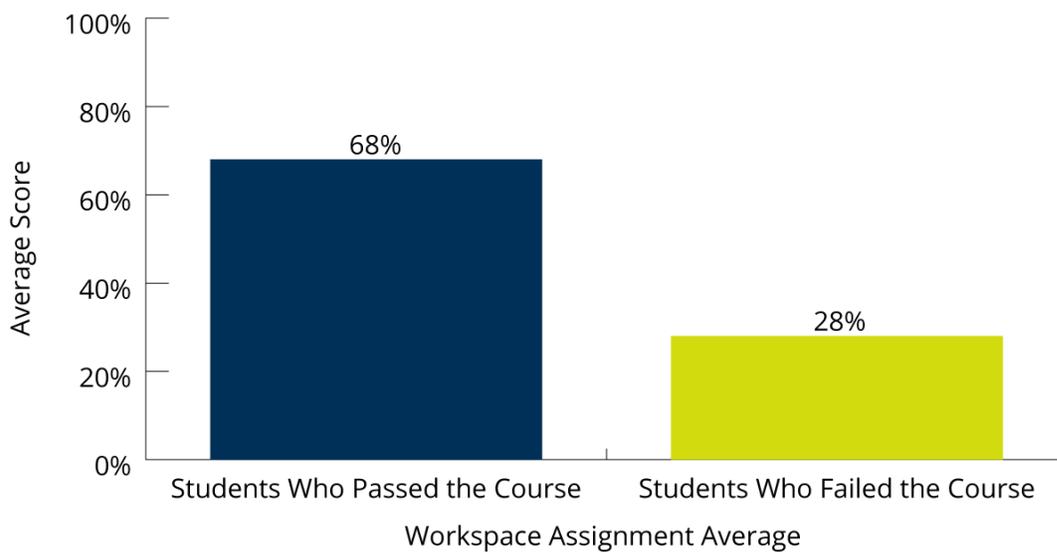
Figure 3. Overall Workspace Assignment Averages for Students Passing (*n*=100) or Failing (*n*=28) the Course

The Student Experience

In a voluntary student survey (88 percent response rate), students were asked their opinions on using MyLab Math.

- 86 percent of responding students found MyLab helpful in preparing them for exams.
- 81 percent of responding students found MyLab helpful in providing adequate practice to aid them in understanding the concepts.
- 71 percent of responding students found MyLab helpful in making them more confident in their abilities to understand the concepts.

When asked "How has MyLab Math impacted your learning in the course?" students responded:

- *"It helped me understand concepts that I wouldn't understand otherwise if I was just using the textbook."*
- *"Using this program allowed me to get a good refresher for math topics that I had completely forgotten about since high school."*
- *"It was a different way of learning topics I was not comfortable with before. Great help when solving problems!"*
- *"It takes everything step by step and helps me understand why certain things were wrong."*

Conclusion

Ruthmae Sears hoped that adding MyLab workspace assignments into the Intermediate Algebra course would help students learn to understand what they were doing, rather than relying on rote memorization of skills and procedures, and allow faculty to better see their students' thought processes as they completed exercises. Correlations show strong relationships between workspace and both final exam scores and final course scores, and results show that students who passed the course had significantly higher scores on workspace assignments than those who did not pass. Faculty now use workspace results to learn more about how their students are thinking and can adjust the rigor of the course accordingly to meet students' needs. Says Sears, "Workspace now allows us to see the [students'] process [and] what they are thinking about along the way."