MyLab Math educator study looks at student homework performance vs. test performance in Contemporary Math course at Richland College

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| MyLab Math with *Thinking Mathematically* by Blitzer | - Data for this course show a strong positive correlation between students’ MyLab Math homework averages and test averages.  
- Data indicate that students who earned higher MyLab Math homework averages and study plan scores, showing mastery of course material by earning an overall A/B/C course grade, had average MyLab Math homework scores 67 percent higher and average study plan scores 64 percent higher than students who earned a D/F in the course.  
- Instructor feels that MyLab Math's quality, instantaneous feedback is its greatest advantage for student learning. |

**Setting**

Part of the Dallas County Community College District, Richland College (RLC) has focused on teaching, learning, and community building for more than 40 years. In recognition of these efforts, the White House and the Department of Commerce named RLC a 2005 recipient of the Malcolm Baldrige National Quality Award, the only community college to have received this award.
Each semester, Richland serves approximately 20,000 credit and 4,800 non-credit students who come from more than 130 countries and speak 79 different first languages. Other demographics include:

- Female: 55 percent
- Male: 45 percent
- Anglo: 28 percent
- Hispanic: 30 percent
- African-American: 21 percent
- Asian/Pacific Islander: 14 percent
- Unknown: 5 percent
- International: 1 percent
- Native American: 0 percent
- Average age: 26

**About the Course**

The Contemporary Math course at RLC is a core curriculum course and requires that students be college-level ready in mathematics at the non-algebra or algebra levels. While an entry-level course and open to any student meeting Texas Success Initiative standards of college readiness, students must demonstrate qualifications with appropriate assessment test score or having successfully completed Intermediate Algebra. The course's topics may include introductory treatments of sets, logic, number systems, number theory, relations, functions, probability and statistics. Appropriate applications are included.

**Challenges and Goals**

Teaching large-enrollment, often-terminal courses like Contemporary Math presents a number of challenges, including transparency in grades and grading, providing students personalized and immediate feedback and help, and allowing for diverse learning experiences. By adopting MyLab™ Math for her Contemporary Math course, Yolanda Manzano, Professor of Mathematics, hoped to provide students with a resource that would:

1. Allow them to know their grades at all times;
2. Provide assistance finding errors in problems while working them, thus promoting “productive struggle;”
3. Provide access to a variety of help aids that are tailored to different learning styles; and
4. Help students become more motivated to complete mathematics because of the software’s clear content support in a non-threatening, user-friendly manner.

Manzano was also interested in understanding if there were specific resources or tools in MyLab that correlated with student success so that she and her colleagues could build on that information.

**Implementation**

At the beginning of the semester, students are given a course calendar with their syllabus that details all MyLab Math assignments. Students complete these assignments in MyLab Math outside of class.
Homework

- All homework assignments are completed in MyLab Math.
- For each section, students start by viewing the section video. These videos are prerequisites for the homework. As they watch the video, Manzano encourages students to study and take notes on all explanations and examples to clarify any concepts that they may have missed during lecture. Students are allowed to skip ahead in the video if they feel confident with the material presented.
- Students then move on to the homework assignment. It is suggested to students that they work the homework problems in a notebook, showing written work for all problems so that they and their instructor can see what the problem was asking, and what steps the student used to arrive at the answer.
- Students must score a minimum of 85 percent on each exercise set before moving on to the next.
- Homework problems submitted late are penalized 10 percent.
- Manzano drops the three lowest homework grades, though she does not broadcast this in the syllabus because she wants students to put full effort into all homework assignments.

For the most part, each homework problem has four similar problems available; in other words, students are allowed four attempts per problem before it is counted wrong. For those problems where learning aids are available, students are cautioned to use the Help Me Solve This learning aid wisely. Manzano tells students, “If you click on Help Me Solve This before grading a problem, it uses up one similar problem. However, it is a very useful tool and is still accessible on a problem after it has been graded.” Students are also encouraged to make use of the View an Example feature. It is strongly recommended that students use the Study Plan and the e-book to learn the material.

Chapter tests and final exam

- Chapter tests are 55-minute, paper-pencil tests administered in class as scheduled in the course calendar. All tests require free response and critical thinking. Students do not receive credit for correct answers without demonstrating supporting work because Manzano wants to ensure students understand how to get to the correct answer. Tests cannot be retaken; however, as long as the final exam is not a student’s lowest test score, the lowest test score may be replaced by the final exam score.
- The final exam is written and taken in-class as scheduled on the course calendar. If the final exam grade is higher, it replaces the lowest grade of exams 3–5. Students are encouraged to use the final exam review (found in MyLab Math) to prepare for this exam. The final exam is limited to one attempt.

In the event of a class cancellation due to inclement weather or instructor absence, students are expected to continue to follow the course calendar and submit assignments at the scheduled times. To do so, they are encouraged to use the textbook and the features of MyLab Math such as videos, animations, and the Study Plan to gain an understanding of the material.

In addition to the features noted above, Manzano also utilizes the MyLab gradebook’s Search/Email by Criteria function frequently to give more personalized feedback after tests, major assignments, or just generally to provide encouragement.
Assessments

- 50% Unit tests (tests 1–2 count 7% each; tests 3–5 count 12% each)
- 30% Final exam (comprehensive)
- 10% MyLab Math homework
- 10% Attendance and participation

Results and Data

Fall 2015 grades were analyzed. Figures 1 and 2 are correlation graphs; correlations do not imply causation but instead measure the strength of a relationship between two variables, where \( r \) is the correlation coefficient. The closer the \( r \) value is to 1 or -1, the stronger the correlation. The corresponding \( p \)-value measures the statistical significance/strength of this evidence (the correlation, or \( r \)), where a \( p \)-value <.05 shows the existence of a correlation between these two variables. For Manzano's course, the following correlations were found:

- A strong positive correlation exists between students’ MyLab homework averages and their test averages, where \( r = .57 \) and \( p < .001 \) (figure 1).
- A very strong positive correlation exists between students’ MyLab homework averages and their MyLab study plan scores, where \( r = .78 \) and \( p < .001 \) (figure 2). This is interesting because the study plan does not count towards the students’ final grades. The data suggest further studies are needed to investigate the relationship between students’ effort and extra practice in the study plan and their overall performance. This would support a common saying that math instructors often tell students, “The only way to learn math is to do math.”

Correlation between homework average and test average

![Graph showing correlation between homework average and test average](Image)

Figure 1. Correlation between MyLab Math Homework Average and Test Average, \( r = .57, p < .001 \), Fall 2015 (n=31)
Correlation between homework average and study plan score

![Correlation Graph](image)

Figure 2. Correlation between MyLab Math Homework Average and Study Plan Average, $r=.78$, $p<.001$, Fall 2015 ($n=31$)

In addition, a strong linear relationship of the final course letter grade distribution per average MyLab homework assignment grade exists (figure 3). It should be noted that homework scores comprise 10 percent of the final course grade thus influencing this relationship.

- Students earning a final course grade of A, B, or C scored 36 percentage points higher on homework in MyLab than those students earning a final course grade of D or F; A, B, or C students averaged 90 percent on homework while D or F students averaged 54 percent.
- Students earning a final course grade of A, B, or C scored 14 percentage points higher on the study plan in MyLab Math than those students earning a final course grade of D or F; A, B, or C students averaged 36 percent on the study plan in MyLab Math compared to students earning a final course grade of D or F, who scored an average of 22 percent. Because activity in the study plan does not count towards the students’ final grades, performance in this space may be considered an indication of effort. One could argue that A students typically put forth more effort than the rest of the group. With that in mind, students earning a B or C in the course were compared to students earning a D or F. Students earning a B or C in the course averaged 33 percent in the study plan, 11 percentage points higher than students who earned a D or F in the course.

One student who earned a D in the course did not take the final exam and received a zero but had a test average of 82 percent and a homework average of 81 percent.
The Student Experience

An end-of-semester, voluntary survey was distributed to Manzano’s Contemporary Math students in Fall 2015 (35 percent response rate). In that survey, respondents acknowledged that they understood the importance of doing work outside of class:

- 91 percent said it was somewhat or very important that they come to class having completed work outside of class while 55 percent admitted to coming to class often or very often without having completed the associated MyLab Math homework assignment.
- 63 percent said it was somewhat or very important that they ask questions or contribute to class discussions in other ways, but just 45 percent actually said they often or very often did so.
- 91 percent said it was somewhat or very important to work with others to complete projects or assignments; 64 percent reported often or very often asking another student for help understanding a topic, and 73 percent reported often or very often explaining material to other students.

In addition, respondents reported that MyLab Math was helpful in several areas, including preparing them for exams and future courses as well as providing different ways to learn (figure 4).
Student survey responses

![Bar chart showing student responses to MyLab Math helpfulness](chart.png)

Figure 4. Student Responses to the Question, “How helpful was MyLab Math in the following areas?” Fall 2015 (n=11)

Some comments made by students about MyLab Math when asked, “How has MyLab Math impacted your learning in this class?” were:

- “This class has helped me to get ready for my future. Now I can calculate my own bills for my home, car insurance, gas, etc.”
- “It helped with understanding a lot of complicated methods.”
- “It has helped me do math much easier and learn it well.”

Conclusion

By adopting MyLab Math for her Contemporary Math course, Manzano hoped to provide students with a resource that would allow them to know their grades at all times, have help finding errors in problems while working them, and provide access to a variety of help aids that are tailored to different learning styles. Manzano is pleased with the results thus far and feels that the students’ responses to the survey, especially, reflect that MyLab Math is doing what she’d hoped it would. She says, “The greatest advantage of MyLab Math is that it provides quality feedback to students instantaneously. I appreciate that the students feel they are getting so much help from the program.”