MyAutomotiveLab

School Name	Delaware Technical and Community College, Stanton Campus, Newark, DE
Course Name	Introduction to Automotive Technology
Course Format	Flipped, lecture

Key Results Data show that students who earned a passing score (70 percent or higher) on MyAutomotiveLab posttests earned considerably higher quiz and test scores than did students who earned less than 70 percent or did not take a posttest. In addition, students who achieved an average grade of A, B, C on both quizzes and tests had substantially higher average MyAutomotiveLab homework grades.

Submitted by
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Course materials
MyAutomotiveLab and *Automotive Technology: Principles, Diagnosis and Service,* Halderman

Setting

Delaware Technical and Community College is a public two-year community college with campuses in Georgetown, Dover, Stanton, and Wilmington. Systemwide, the school serves more than 23,000 students per year; approximately 6,000 attend the Stanton campus. Thirty-two percent of the school's students are 19–21 years of age and 24 percent are more than 30 years of age, 95 percent are Delaware residents, 58 percent attend part time, and 53 percent identify as a minority.

Introduction to Automotive Technology, the first course in the automotive associate degree program, is a one-semester three-credit course that offers students a practical hands-on introduction to the automotive repair industry via classroom instruction, required labs, and an internship with a local business. Students spend two hours per week in lecture and two hours per week in lab. Upon completion of the course, students will have demonstrated mastery of the following objectives.

- Use appropriate automotive diagnostic and service equipment, hand tools, and precision measuring devices to determine and perform necessary repairs.

- Interpret electronic service information, service manuals, and diagnostic charts.

- Document service repair procedures that accurately reference the three Cs: customer complaint verification, correct the problem, and complete the repair.

- Employ service-facility safety practices.

- Practice professional automotive industry conduct.

Challenges and Goals

The National Automotive Technicians Education Foundation is a nonprofit organization that examines the structure and resources of training programs and evaluates them against nationally-accepted standards of quality. When the organization allowed automotive coursework to be completed online, Spinelli and his colleagues decided to add a digital component to their course. Because of the time constraints in lecture, they realized that an online, outside-of-class component would enable more material to be covered, while also providing students with much-needed reinforcement. In 2011, Spinelli chose MyAutomotiveLab for its interactive activities, including prelecture concept introduction, in-class demonstrations, and postlecture homework and assessments.

Implementation

In a flipped classroom environment, students perform a series of required activities in MyAutomotiveLab before, during, and after lecture.

Before lecture
- Read the chapter content for the week.

- Take the MyAutomotiveLab pretest, which diagnoses comprehension of chapter content and gives immediate feedback and key concept reinforcement.

- Complete a MyAutomotiveLab homework assignment: 10 multiple-choice questions per chapter; may include an essay question.

Lecture
- Review the MyAutomotiveLab homework questions.

- Use SmartBoards for MyAutomotiveLab video-based activities that demonstrate difficult skills and concepts and contain voice-over explanations and instructional tips.

Students who earned an average quiz grade of A, B, or C had an average MyAutomotiveLab homework score 45 percent higher than students who earned an average quiz grade of D or F.
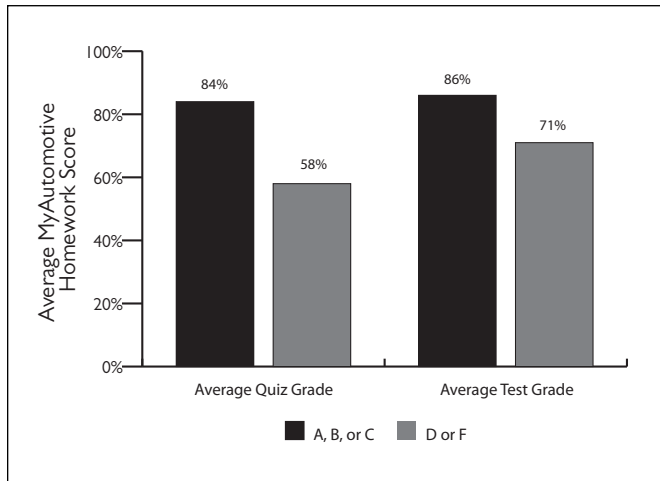

Figure 1. Average Quiz and Test Grades by Average MyAutomotiveLab Homework Scores, Spring 2015 ($n = 180$)
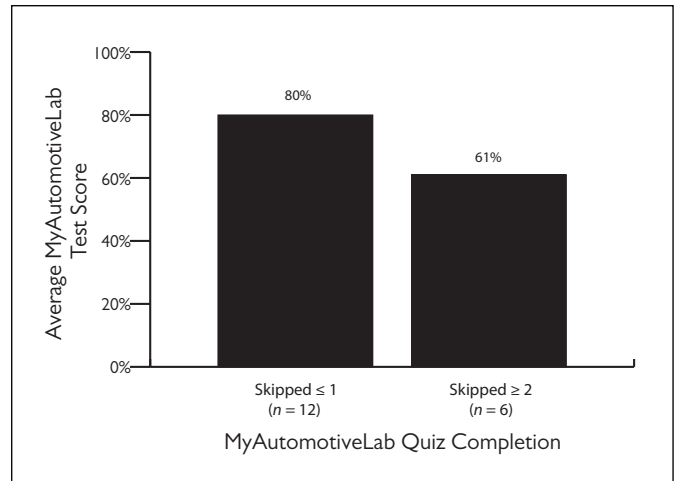

Figure 2. MyAutomotiveLab Quiz Completion by Average MyAutomotiveLab Test Scores, Spring 2015 ($n = 18$)

After lecture

- Complete an optional MyAutomotiveLab posttest, a formative assessment to help students confirm mastery of chapter content before taking higher stakes summative chapter tests.

- Take a MyAutomotiveLab chapter test: 20–30 multiple-choice questions that assess concept mastery.

Because Spinelli uses MyAutomotiveLab to teach much of the chapter content, he can focus more of his time on shop/lab activities. Hands-on midterm and final exams take place in the shop/lab and are designed to demonstrate the ability to apply course content in a real-life setting. Students are also required to contribute to MyAutomotiveLab SmartBoard activities.

Assessments

50 percent	Shop/lab skill assessments
10 percent	MyAutomotiveLab homework
10 percent	MyAutomotiveLab chapter tests
10 percent	Midterm exam
10 percent	Final exam
10 percent	Participation

Results and Data

Student success on course assessments is generally measured by earning an A, B, or C. Figure 1 shows the average MyAutomotiveLab homework score for students who earned an average grade of A, B, or C on quizzes and tests compared to the average MyAutomotiveLab homework score for students earning average quiz and test grades of D or F.

- Students who earned an average quiz grade of A, B, or C had an average MyAutomotiveLab homework score 45 percent higher than students who earned an average quiz grade of D or F.

- Students who earned an average test grade of A, B, or C had an average MyAutomotiveLab homework score 21 percent higher than students who earned an average test grade of D or F.

MyAutomotiveLab quiz completion rates were analyzed to determine if a relationship exists between quiz completion and test scores (Figure 2). Students were placed into two groups based on the average number of skipped quizzes; students who completed more than the average number of skipped quizzes earned substantially higher average test scores.

- Average number of skipped quizzes: 1

[D]ata show that students who took the posttest and earned a grade of 70 percent or higher also earned average quiz and test scores that were higher than those of students who took the posttest and scored lower than 70 percent and students who did not take the posttest.
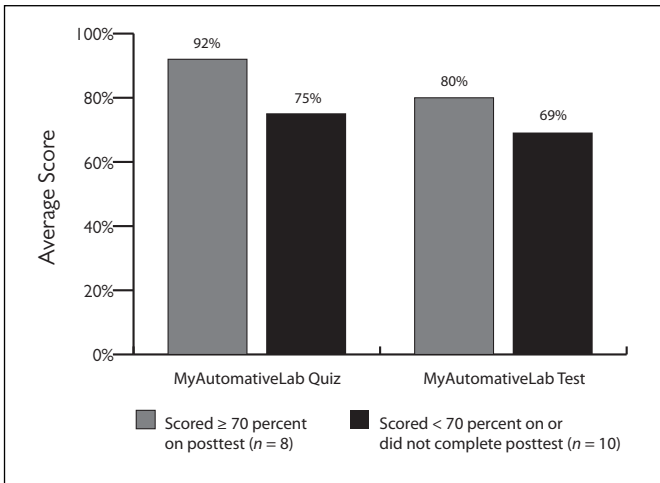

Figure 3. Average MyAutomotiveLab Quiz and Test Scores by MyAutomotiveLab Posttests Scores, Spring 2015 (*n* = 180)
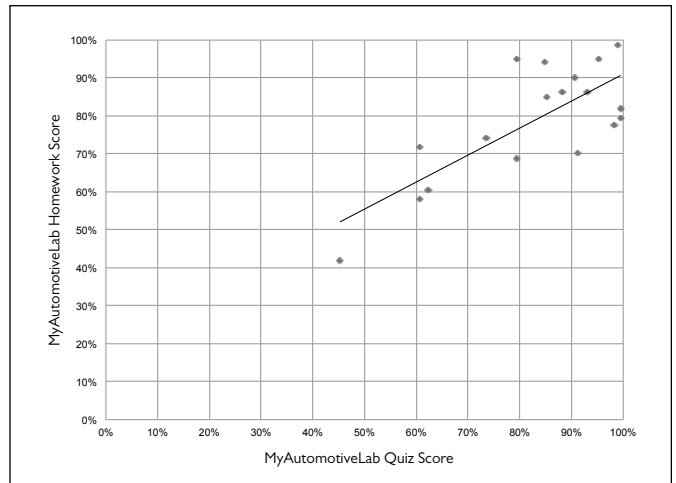

Figure 4. Correlation between Average MyAutomotiveLab Homework Scores and Average MyAutomotiveLab Quiz Scores, Spring 2015 (*n* = 18)
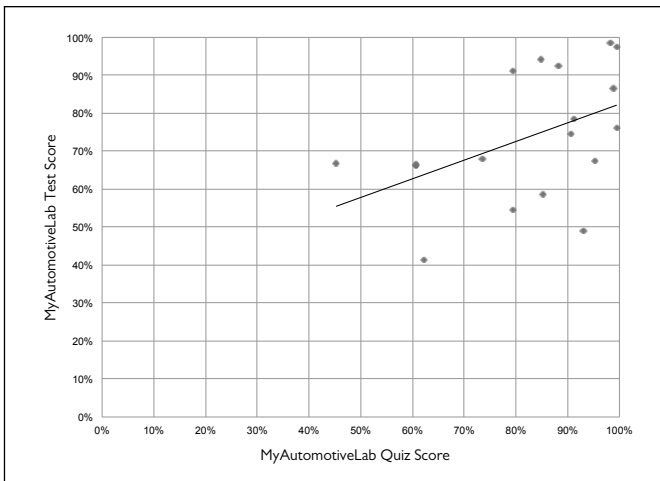

Figure 5. Correlation between Average MyAutomotiveLab Quiz Scores and Average MyAutomotiveLab Test Scores, Spring 2015 (*n* = 18)

- Percentage of students who completed all quizzes: 56 percent (*n* = 10)

- Students who skipped 1 or fewer MyAutomotiveLab quizzes earned average test scores 31 percent higher than students who skipped 2 or more quizzes.

While students were not required to take MyAutomotiveLab posttests, data show that students who took the posttest and earned a grade of 70 percent or higher also earned average quiz and test scores that were higher than those of students who took the posttest and scored lower than 70 percent and students who did not take the posttest.

- Students who scored 70 percent or higher on the posttest earned quiz grades an average of 23 percent higher than those of students who scored less than 70 percent and students who did not complete the posttest.

- Students who scored 70 percent or higher on the posttsest earned test grades an average of 16 percent higher than students who scored less than 70 percent and students who did not complete the posttest.

Figures 4 and 5 are correlation graphs. Correlations do not imply causation, but instead measure the strength of a relationship between two variables. The *p* value measures the statistical significance/strength of the correlation; $p < .01$ is considered strong evidence. Data show a very strong positive correlation between average MyAutomotiveLab homework scores and average MyAutomotiveLab quiz scores, where $r = .76$ and $p < .01$; and a strong positive correlation of average MyAutomotive Lab quiz scores and average MyAutomotiveLab test scores, where $r = .46$ and $p < .05$. As a best practice, MyAutomotiveLab scores may help Spinelli identify students early on who are struggling and at risk of poor course performance.

The Student Experience

In spring 2015, students were asked to participated in a voluntary, end-of-semester survey administered by Spinelli. Survey questions covered students' use of MyAutomotiveLab and its impact on their learning and assessment. Of the students who responded:

83% Agree or strongly agree that their understanding of the course material increased as a result of using MyAutomotiveLab.

83% Agree or strongly agree that the use of MyAutomotiveLab positively impacted their quiz and exam scores.

67% Agree or strongly agree that using MyAutomotiveLab provided additional resources that helped them learn more than they would have from more traditional pencil and paper homework.

On the same survey, when asked what they liked best about MyAutomotiveLab, student answers included the following:

"I liked that it gave me the correct answer when I got an answer wrong. This really helped correct it in my head and I remembered the correct answer next time."

"Very informative, useful information. I highly recommend [MyAutomotiveLab] to future students."

"It gave me my score as soon as I completed my work, and it relates to what we do in class."

Conclusion

A key motivation for flipping the classroom was to increase student participation during lecture. Spinelli sought a way to improve the typical passive learning of course content for such a tactile career as automotive repair. He reports that since redesigning his course with MyAutomotiveLab in a flipped format, students are more responsible for their learning and come to his class prepared to both participate and discover new material to apply in shop.

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Spinelli recommends that instructors apply best practices with MyAutomotiveLab implementations, including using the first day of class to show students where to find MyAutomotiveLab and how to register for the program, and using the program's pretests to establish a baseline for student knowledge. Finally, he says that the MyAutomotiveLab simulations and videos used in his lecture both provide students with a visual review of course content and enable them to see in advance what they will work on during upcoming shop hours.