

## MyLab Statistics educator study explores student engagement and success at Henry Ford College

<p><b>School Name</b> Henry Ford College, Dearborn, MI</p> <p><b>Course name</b> Introduction to Statistics</p> <p><b>Course format</b> Fully online</p> <p><b>Course materials</b> MyLab Statistics with <i>Interactive Statistics: Informed Decisions Using Data</i> by Sullivan and Woodbury; Guided Notebook by Sullivan and Woodbury</p>	<p><b>Timeframe</b> Winter and Fall 2016</p> <p><b>Submitted by</b> Sam Bazzi, Instructor</p> <p><b>Results reported by</b> Traci Simons, Pearson Customer Outcomes Analytics Manager</p>
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### Key Findings

- In this fully online Statistics course, student retention (based on number of students taking the final exam) increased 24 percentage points after adoption of Interactive Statistics product for MyLab™ Statistics.
- After implementing Interactive Statistics, the percentage of students who took the final exam and earned a C or better in the course went from 57 percent in Winter 2016 to 88 percent in Fall 2016.
- Students reported they appreciated the nature of the Interactive Assignments that included videos, chunked text, and feedback, and they found the Guided Notebook that accompanied the product to be very helpful.

### Setting

Henry Ford College is a public two-year college located in Dearborn, Michigan in Metro Detroit. HFC offers a Bachelor of Science in Culinary Arts degree, as well as 100 associate degrees, university transfer, and career programs. The following are some “[fast facts](#)” about HFC for the 2015–2016 academic year:

- Fall 2015 enrollment: 12,861
- Gender: 55 percent female, 45 percent male
- Average age: 25; 42 percent are 20 and younger, 58 percent are 21 and over

- Race: 53 percent Caucasian/White, 19 percent Black or African American, 19 percent unknown
- Full-time/part-time status: 64 percent attend part-time, 36 percent attend full-time
- Financial aid: 58 percent (2014-2015) received some form of financial aid

HFC also publishes several other reports on their [strategy and information page](#), including but not limited to their graduation rate within six semesters (6 percent for 2012 cohort) and transfer-out rate (36 percent for 2012 cohort).

## About the Course

Sam Bazzi has been a math instructor in higher education for 20 years, the last 15 of which have been at HFC where he has been involved in curriculum development, distance education, and incorporating technology into teaching. Bazzi typically teaches the Introduction to Statistics course each semester, usually both face-to-face and fully online sections.

The Introduction to Statistics course at HFC is designed as a first course for students in business administration, education, social sciences, engineering, and other fields in which data are collected and predictions are made. It covers descriptive measures, the summarizing of data, an introduction to probability, discrete probability distributions, normal probability distributions, sampling distributions, estimation, confidence intervals, hypothesis testing, correlation, regression, chi square tests, one-way analysis of variance (ANOVA), and use of nonparametric tests. In addition, the course utilizes a statistical software package to conduct data analysis and solve applied problems. A graphing calculator is required, with the TI-83/84 Plus recommended, along with access to an online homework management system, MyLab Statistics, as well as a statistical software package. The course is a four-hour credit course and requires a C or better in either Quadratic Equations and Functions or Intermediate Algebra as a prerequisite, or a satisfactory score on the placement test.

## Challenges and Goals

As an instructor, Bazzi was concerned that his students were not using the materials he was requiring them to buy. He had used the textbook and created videos for students to watch, but he didn't feel that his students used them to their fullest potential and lost the sense of cohesion between them. The lack of motivation he saw in his students spurred him to look for something different. When he saw that the Interactive Statistics through MyLab Statistics could require students to watch videos before answering a homework question, he decided to pilot the program in Fall 2016, hoping that it would increase student engagement and, ultimately, improve student outcomes.

## Implementation

Bazzi chose to pilot the [Interactive Statistics](#) product through MyLab Statistics because the "text" was written entirely in the online program and broke topics down in manageable chunks. He states, "I liked that it didn't have too much text but just enough to explain the concept. My students aren't math majors, and they just want to understand statistics enough to fulfill their requirement, and I felt that since the text and videos were integrated together, this would meet their needs."

Students start each week by completing an [Interactive Assignment](#) in MyLab Statistics. In Interactive Assignments, students "read a little, watch a little, and do a little" by completing three steps: Preparing for this Section, Read and Interact, and Assessment. The following is a breakdown of how

Interactive Assignments are structured:

- Preparing for this Section—each assignment begins with a brief review and exercises designed to assess mastery of the prerequisite topics needed to move through the upcoming section objectives.
- Read and Interact—each Interactive Assignment is broken down by chapter section and organized by section objective. Students move through each objective by reading text and then interacting with a variety of strategically placed multimedia elements so they learn each concept in the most effective way. The following are some of the multimedia elements students may interact with:
  - **Step-by-Step Examples** guide a student from problem to solution in easy-to-follow steps. Examples and solutions are also provided via video, with instruction described in several different formats—by-hand, TI-84C, and StatCrunch.
  - **Technology Step-by-Step** instructions walk students through using the TI-83/84 Plus and StatCrunch in each example solution.
  - **Applet Activities** help students learn concepts through an experiential approach. Follow-up exercises assess understanding of the concepts.
  - **Caution animations** alert students to potential pitfalls when conducting statistical analysis.
  - **In Other Words** animations take statistical definitions and concepts, and state them in simple, everyday language.
  - **Real data** throughout the eText and Interactive Assignments, exercises, and examples pique student interest and show the relevance of statistics to real life.
- Assessment—each example is followed by an assessment that asks students to work through built-in exercises to assess their mastery of the concepts they just reviewed.

Bazzi's students are expected to complete Interactive Assignments to a grade of at least 70 but up to 90 percent, depending on the assignment/section. By setting the assignment up as a prerequisite to their section homework, Bazzi is able to ensure that students have at least a passing understanding of the concepts before moving forward. At the conclusion of the Interactive Assignment, homework is pre-assigned so students may test their understanding of each section in its entirety. Bazzi allows students unlimited attempts on both assignments, and there is a weekly due date, though he does extend the due date for extenuating circumstances.

Every 1 to 2 weeks, students complete a timed chapter quiz and are allowed three attempts. The time limit depends on the material covered, and Bazzi uses the metrics available in MyLab to determine how much time he should allow his students to complete the quiz. Bazzi also says that he allows them multiple attempts because he doesn't want his students to worry about the grade when they do the work online, but rather to worry about the work they're doing. He feels that by allowing multiple attempts on this low-stakes assessment, his students will focus more on understanding the concept rather than just getting the right answer.

Three exams over multiple chapters and a comprehensive final exam are completed in MyLab in a proctored environment; students enrolled in fully online courses must come to the school's testing center and take the test during the specified time period.

In addition to completing interactive assignments, section homework assignments, quizzes, and tests in MyLab, Bazzi also requires his students to post responses in chat forums on a chapter-by-chapter basis. They also must complete a project in [StatCrunch™](#), a statistical software that is built in to MyLab Statistics. This project covers most of the material presented in the course and is designed to help students understand how all the different concepts relate to each other. In addition, throughout the course, students must complete the Guided Notebook that is packaged with the Interactive Statistics access code. The Guided Notebook is an interactive student workbook that leads students through the course. It provides structure for recording key information from the course and helps students take good notes for review.

Finally, Bazzi stays very engaged with his students, especially those in his fully online sections. In addition to creating his own videos, he makes sure to check the MyLab gradebook often to see where students are struggling. When he sees students are struggling, he intervenes with explanations or videos.

### Assessments

- |                    |                                      |
|--------------------|--------------------------------------|
| ● 300 pts / 37.5%  | Exams (3 at 100 points each)         |
| ● 130 pts / 16.25% | Cumulative final exam                |
| ● 120 pts / 15%    | Homework and interactive assignments |
| ● 100 pts / 12.5%  | Quizzes                              |
| ● 60 pts / 7.5%    | Chapter forum discussions            |
| ● 50 pts / 6.25%   | Guided notebook                      |
| ● 40 pts / 5%      | StatCrunch project                   |

### Results and Data

“I’ve never had this many students stick with the online course. With all of this course interactivity, we bring to the students an experience that is similar to or even more effective than the classroom experience. This is another reason why students persisted and felt that they can learn independently.”

Results were compared from Bazzi’s Winter 2016 section where he used MyLab Statistics with a traditional textbook online and his Fall 2016 section where he used Interactive Statistics. Bazzi usually gives three proctored tests and a final exam each semester. The tests do not vary much from one semester to another. He included the same topics and the difficulty level is very much the same ensuring that he was able to compare test results from one semester to another. Table 1 shows the topics covered in each test.

Test 1	Test 2	Test 3	Final Exam
Descriptive Statistics & Probability	Discrete/ Normal Probability and Confidence Intervals	Inferential Statistics	Cumulative, excluding descriptive statistics topics

Table 1. Topics covered on each test, Winter 2016 and Fall 2016

While the tests are similar, Bazzi addresses the notion that each semester’s students may be different: “While we noticed that some Winter semester students tend to be not as motivated or as prepared as Fall semester students, the sections we’re comparing in this study are fully online sections, and I don’t believe that difference is as distinct between semesters.”

Figures 1–3 show average test scores, percentage of students earning C or better on tests, and percentage of students taking each test. In all metrics measured, students who used Interactive Statistics performed better than students in the previous semester who used MyLab Statistics with the traditional textbook.

### Student performance on tests

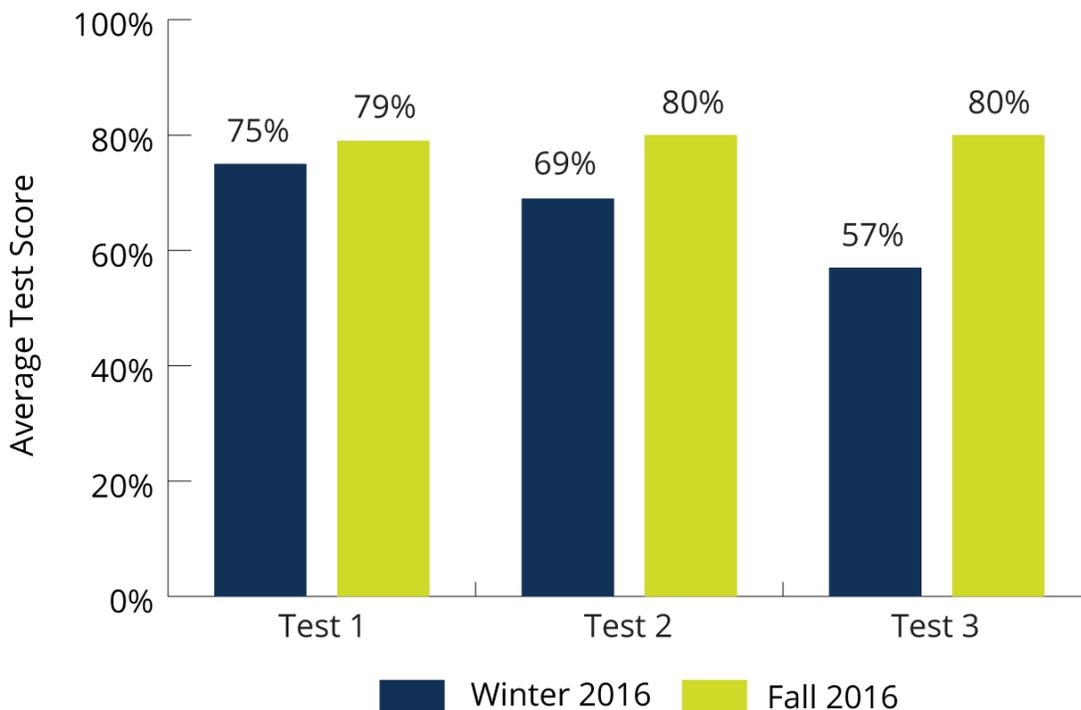


Figure 1. Student Average Test Scores, Winter 2016 and Fall 2016 (n=75)

While students who used Interactive Statistics had better average scores on their tests than those who used a traditional textbook with MyLab Statistics, Bazzi is most excited about the increase of C or better grades on the tests (figure 2). “Not only did the test average increase, but more students actually passed the tests, which shows me they were better prepared and really understood the material in each section,” Bazzi states. He points out the large difference on test 3: “Through the blending of media and text all together, this book has done a great job explaining and interpreting the P-value approach commonly used when performing hypothesis tests, which explains the increase in the average score on test 3 (covering inferential statistics topics).”

### C or better on tests

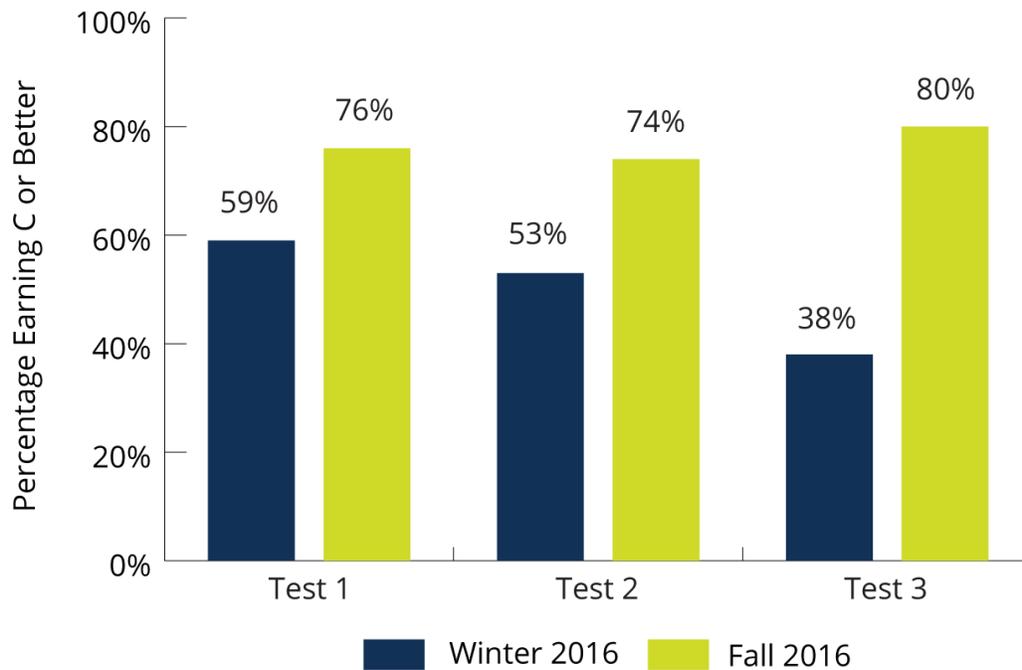


Figure 2. Percentage of Students Earning C or Better on Tests, Winter 2016 and Fall 2016 ( $n=75$ )

In addition, more students took each test, which, to Bazzi, shows him that more students persisted through the course (figure 3). “I’ve never had this many students stick with the online course,” he states. He believes that the materials provided through Interactive Statistics, with its chunked material and prescriptive learning path, helps students to stay involved in the material and not get so lost that they drop out. Bazzi continues, “With all of this course interactivity, we bring to the students an experience that is similar to or even more effective than the classroom experience. This is another reason why students persisted and felt that they can learn independently.”

### Student participation on tests

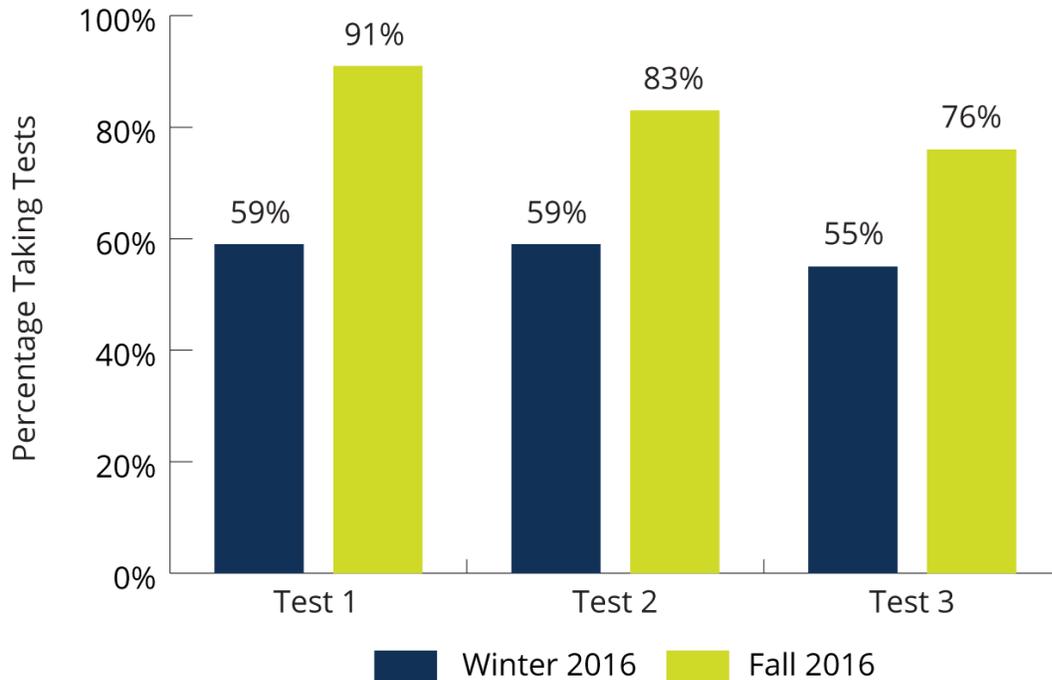


Figure 3. Percentage of Students Taking Tests, Winter 2016 and Fall 2016 ( $n=75$ )

Figures 4 and 5 break out participation and performance on the final exam. Bazzi observed a much better retention rate within the semester itself. Forty-eight percent of the students on the original class roster in Winter 2016 took the final exam. The percentage of students taking the final exam in Fall 2016 increased to 72 percent with the Interactive Statistics product. In addition, Bazzi's Fall 2016 students experienced a much higher passing rate (C or better) on their final exam: 57 percent of the students who took the final exam in Winter 2016 received a final exam grade of C or better compared to 88 percent in Fall 2016. Because the final exam is cumulative, Bazzi believes the C or better metric is the best indication that his students retained more information in his Fall 2016 course compared to the Winter 2016 course.

### Final exam participation and performance

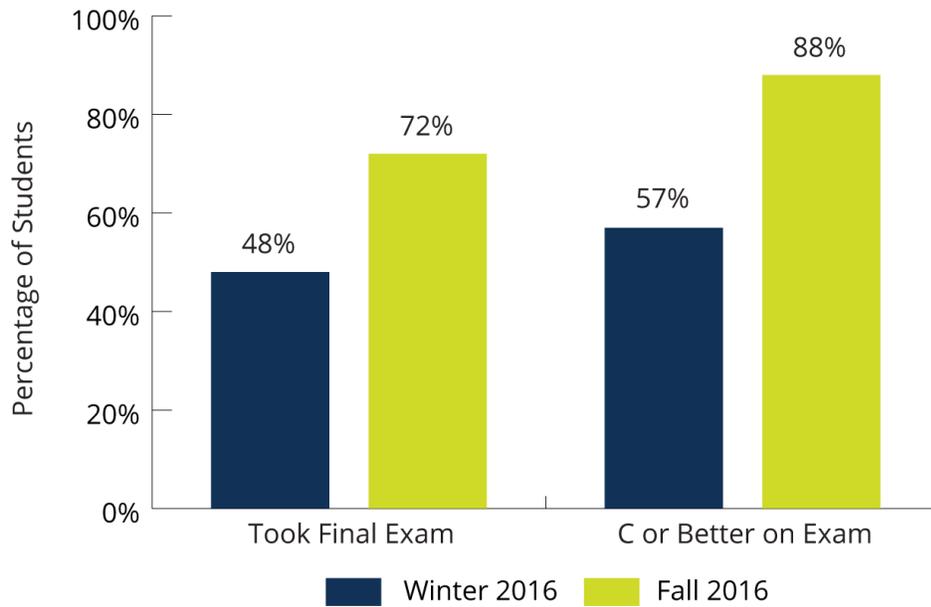


Figure 4. Percentage of Students Who Took Final Exam and Percentage of Those Students Who Received C or Better on Final Exam, Winter 2016 and Fall 2016 ( $n=47$ )

### Final exam average

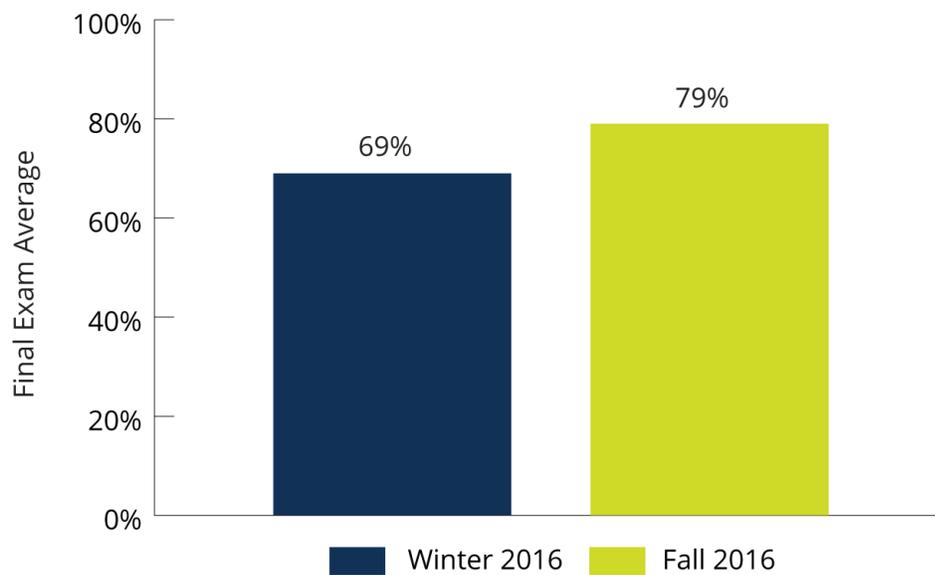


Figure 5. Students' Average Score on Final Exam, Winter 2016 and Fall 2016 ( $n=47$ )

Overall course pass rates almost doubled after switching to the Interactive Statistics program. Winter 2016's section started off with 29 students, 14 of whom took the final exam and 10 earned a

C or better in the course with a pass rate of 35 percent. Fall 2016's section started off with 46 students on the roster, 33 of whom took the final exam and 31 of them earned a C or better in the course for a 67 percent pass rate.

## The Student Experience

Bazzi emailed his students in Fall 2016 requesting their thoughts on two parts of the course: 1) their experiences with the guided notebook and whether it was useful, and 2) their experiences with interactive assignments: working with videos, animations, chunked text, etc.

The following are excerpts from the replies he received:

- *"I had a good experience with guided notebook because it helped me a lot in organizing the information and reviewing before tests. Also I had a pretty good experience with the interactive assignments, and the videos were so helpful to understand the course. Also I like the summarizing boxes."*
- *"My experience with the guided notebook was fairly easy, it had questions and examples and you just have to keep up with the online work and you will be set. As for the interactive assignment, it was also great and easy to use. It was great. An amazing experience and it is really helpful."*
- *"I actually thought this was a very well-run online math course as I was skeptical in the beginning. 1) The guided notebook was extremely helpful and I actually really enjoyed using it instead of in-class notes like you would normally have. It definitely came in handy a lot throughout the semester and was very helpful. 2.) I enjoyed the videos when going through the interactive assignments and I think that they really explained the information quite well. Also the online videos that you posted to help further explain the material and the thorough study guide videos were very helpful as well."*
- *It was a very well-run and organized online math course; I really enjoyed it! Everything was explained very well whether you made a video or it was through the guided notebook, but it was all run very neatly. Also you sent many emails every couple days or every day even and those were very helpful as well."*

The students who responded to Bazzi's request for feedback confirmed to Bazzi that his goal of providing students with materials they would use was met by using the Interactive Statistics product through MyLab Statistics.

## Conclusion

When Bazzi initially adopted Interactive Statistics, he wanted to increase student engagement with the materials and improve student outcomes. Based on student feedback, Bazzi feels student engagement has increased due to videos, now required before answering homework questions, and the Guided Notebook. Data from the first semester of use also show that student outcomes have improved, both on tests and on the final exam.

Bazzi looks forward to continuing to monitor student performance and usage of the required materials and hopes to turn the course into a project-oriented one, depending even more heavily on MyLab Statistics to provide students necessary practice and remediation while spending more time in class working on projects.