

Product Name MasteringBiology  
 Course Name General Biology II  
 Credit Hours Three (lecture), One (lab)

**Key Results** Increasing the use of MasteringBiology enabled more active learning opportunities, promoted more-efficient lectures and office hours, and resulted in higher exam scores.

## Text

*Campbell Biology: Concepts and Connections, 7e*, Jane B. Reece, Martha R. Taylor, Eric J. Simon, and Jean L. Dickey

## Implementation

This is the second course in a three-quarter (10 week) sequence. It is a fundamental biology course designed for non-biology majors, who have a science requirement. The course is a broad approach to the field of biology, with this session focusing on an introduction to anatomy and physiology of plants and animals. Approximately 350 students per year take the course, which includes both lecture and lab components.

To enhance the lecture I've incorporated active learning into the course, including MasteringBiology, iClickers, worksheets, "think-pair-share," and group activities. In academic year 2009/10, the first year I used MasteringBiology, I provided optional practice assignments that students could earn extra credit by completing. Starting in fall 2010, each quarter I required five to eight MasteringBiology assignments, which accounted for five percent of the students' final course grade.

When I noticed the impact MasteringBiology was having on student learning, I made additional course changes, including requiring one MasteringBiology homework assignment each week. I increased the weight of the assignments to 15 percent of the final course grade in 2011, and to 25 percent in fall 2012. In addition, up to 25 percent of the exam questions are pulled directly from the MasteringBiology study area.

### Assessments (AY 2011/12)

70 percent	Exams (four, the lowest is dropped)
15 percent	MasteringBiology homework (10, the lowest is dropped)
15 percent	Written homework (three)

## Results and Data

When I assigned MasteringBiology for bonus credit, few completed the assignments. When polled, they stated it was because "the assignments were optional." The following year, I required MasteringBiology assignments—and almost every student who completed the assignment earned 100 percent. But I still found that approximately 20 percent of the students didn't complete any of the assignments, and that less than 10 percent used MasteringBiology's other study resources.

In AY 2011/12, I changed my assignment design. In the previous years (2009 and 2010), students had unlimited time and three chances to get each question correct. Statistically, with three attempts and four answer options, students are highly likely to earn 100 percent simply by process of elimination—not by learning. When I allowed two attempts with unlimited time, the MasteringBiology grades averaged 88–93 percent, and, with the additional grade weight of the assignments, more students completed them. When polled, more than 40 percent of students reported also using the study area and eText on a regular basis. More than 70 percent of students said they used the study area and eText at least once during a given quarter.

To learn how MasteringBiology facilitates student learning, I evaluated the results of two exams: plant physiology and animal anatomy—often the most predictive of the students' final performance for the second course in general biology, and which include concepts that are built upon in the third course.

The results show a six to eight percentage point increase in exam grades as I required MasteringBiology assignments, increased the value applied to them, and included the program's study-area content on my exams—a significant difference in a student's final course grade (see figures 1 and 2). In addition to a general trend of increasing exam scores, another interesting change is a tightening of the exam scores and final averages, even with a wide range of student majors from across campus.

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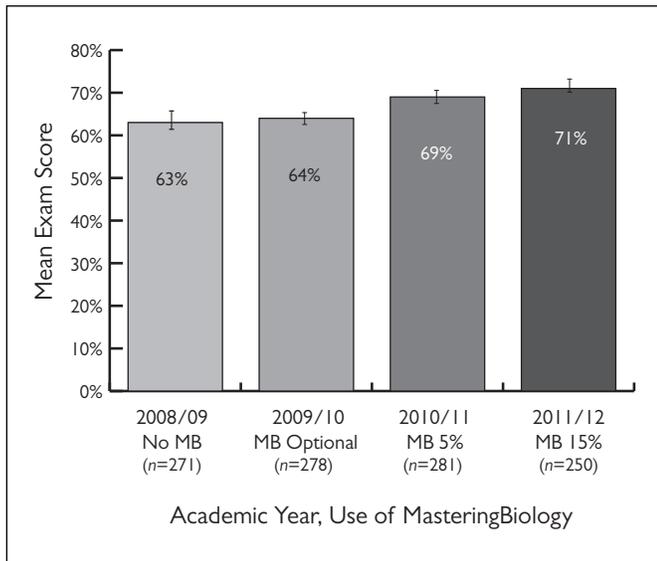


Figure 1. Mean Plant Physiology Exam Scores, General Biology II, 2008–2012 (Err Bars=St Err)

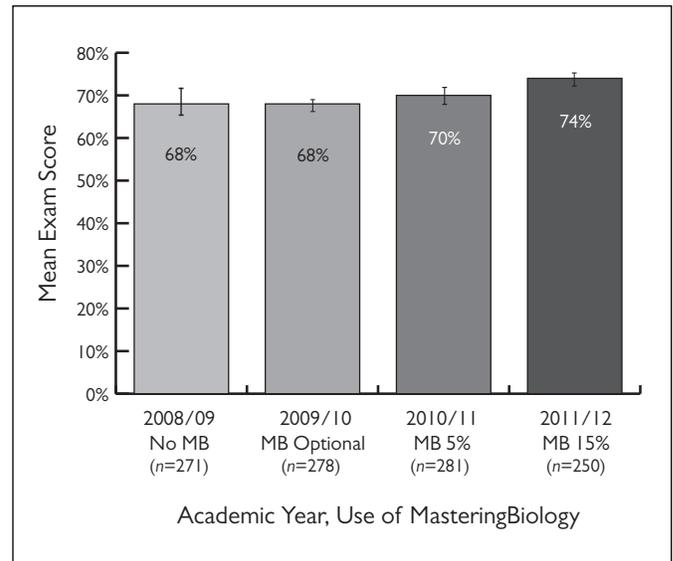


Figure 2. Mean Animal Anatomy Exam Scores, General Biology II, 2008–2012 (Err Bars=St Err)

## The Student Experience

Students like to review lecture content in a visual format, use MasteringBiology tutorials to practice the concepts, and appreciate the convenience of the study area resources and eText. Students spend more time in MasteringBiology after the first exam, and office hour questions are often based on content they are working in MasteringBiology, which makes office visits more efficient. Comments from students in written evaluations include:

- *“I wish our exams were as interactive as MasteringBiology. I love learning that way.”*
- *“The videos helped me grasp the materials. I wouldn’t have done as well on the test without MasteringBiology.”*
- *“I enjoy doing my MasteringBiology assignments, and prefer them to written homework.”*
- *“More MasteringBiology—’nuf said!”*

## Conclusion

MasteringBiology is a great addition to my course because of the benefits both my students and I experience. There has been an increase in exam averages every year, a tightening of scores, and an increased understanding of the materials—conceptually and through application. Students are more likely to ask questions, even in the large lecture hall, as they identify cumbersome topics. This, in turn, helps increase interest in and retention of the materials between courses. From an instructor viewpoint, MasteringBiology frees time I formerly spent grading multipage written homework and enables me to work directly with my students. What’s more, because students come to class better prepared, I’m able to implement more active learning in the classroom—and make learning in a large lecture setting more engaging, more effective, and more fun.

*Submitted by Sandra J. Connelly  
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