

Product Name MasteringA&P, MasteringMicrobiology

Course Name Human Anatomy & Physiology II, Introductory Microbiology

Credit Hours Four each (lecture and lab)

MasteringA&P and MasteringMicrobiology were adopted to enhance opportunities for critical thinking, improve student preparedness for lectures and labs, foster more engaging laboratory experiences, improve student success and retention rates, and facilitate a more efficient use of class time. This case study provides both qualitative and quantitative illustrations of how they were implemented to achieve these goals and the outcomes that were gained as a result.

Key Results Grade data indicate that use of Mastering learning technologies enhances student pass rates and improves student retention. Student feedback and faculty observations suggest that it also helps students better prepare for both lecture and lab and more fully engage in the curriculum.

Texts

Human Anatomy and Physiology, 9e, Elaine N. Marieb and Katja Hoehn; *Microbiology: An Introduction*, 11e, Gerard J. Tortora, Berdell R. Funke, and Christine L. Case

Implementation

Mastering was implemented in two different courses: Human Anatomy and Physiology II and Introductory Microbiology. Both courses are mandatory prerequisites for allied health majors, including nursing students and are offered as combined lecture/lab curricula.

Human Anatomy and Physiology II is a continuation of Human Anatomy and Physiology I. Students must earn a C or higher in A&P I to take A&P II. The course reviews the cardiovascular system, the lymphatic system and immunity, the respiratory system, the digestive system and metabolism, the urinary system, fluid/electrolyte and acid/base balance, and reproductive systems.

The prerequisite for Introductory Microbiology is a C or higher in any college-level chemistry course. The introductory course focuses on bacteria, viruses, fungi, protozoans, and helminthes of medical and economic importance.

Each curriculum is divided into four modules. Each module includes lecture and lab material, a homework assignment, laboratory quizzes, and a module exam. Lab quizzes and homework are delivered via Mastering. Students are encouraged to research homework answers and to work in groups; lab quizzes are a more rigorous, individual effort.

MasteringMicrobiology is a great tool that puts the responsibility for learning on the student.

Cognitive psychologists describe cognition as developing in stages, with critical thinking (post-formal cognition) being the highest level of thinking and one that primarily develops during adulthood. Studies suggest that foundational knowledge, practice, behavior modeling, and opportunities for reflection all contribute to developing post-formal cognition. I chose Mastering because it has the tools and resources I need to easily embed in my courses the kind of pedagogical practices that support higher-order cognitive development.

Redesigning my course using Mastering enabled me to infuse three layers of pedagogical practices that foster higher-order cognitive development: (1) priming of the mind with basic knowledge before a higher order academic task is approached in lab or discussed in lecture, (2) providing timely formative feedback that allows for real time student redirection and addressing of misconceptions, and (3) in-class opportunities for reflection focused on areas in which students have the most difficulty.

“Mastering helped me interact with the material instead of just reading it out of the book. It challenged my mind.”

—Student

These three pedagogical practices were delivered via the following:

- *Mastering homework assignments for each module due one week before the exam.* Each homework assignment takes approximately 90 minutes to complete and contains reading, tutorial, and activity questions. I review the item difficulty graph from the gradebook diagnostics with students during class. I identify the most commonly missed items and therefore am able to address misconceptions before an exam.

During these in-class reflection sessions, students often agree that they struggled with a particular concept or question. Initially students will say a commonly missed question was “tricky.” Once we go over the questions, it becomes clear that the question itself was not tricky; rather it required a higher level of thought and understanding. The collaborative review of commonly missed problems enables me to model the problem solving process. The aggregated class diagnostic data in the Mastering gradebook offers me a real-time snapshot of each class and facilitates a prescriptive approach to refine and redirect my students’ efforts.

- *Mastering pre-lab quizzes due by the lab session.* My goal is to ensure students come to lab prepared. To that end, quizzes are timed and open a week before lab. Questions are scrambled and include Video Tutor and lab questions. As with the homework assignments, we spend about 10 minutes reviewing the gradebook diagnostics from the quizzes together—especially the item difficulty graph—and addressing any misconceptions before lab. This shifts the lab experience from a “cookbook” session to a more integrated and reflective experience. Students enjoy the labs more now and so do I; they feel empowered to investigate not regurgitate.
- *Post-lab assessments comprising more application-based questions.* These assessments are designed to ensure that students have mastered the concepts explored during lab. In Introductory Microbiology the post-lab assessment is a quiz in MasteringMicrobiology. In Human Anatomy & Physiology II, the post-lab assessment is a lab report.

Assessments

A&P II

53 percent	Lecture exams
18 percent	MasteringA&P homework
11 percent	MasteringA&P pre-lab quizzes*
9 percent	Lab reports
9 percent	Cumulative, lab final exam

Microbiology

57 percent	Lecture exams
15 percent	MasteringMicrobiology homework
7.5 percent	Cumulative lab final exam
7.5 percent	Identification of bacterial unknown with comprehensive report
7 percent	MasteringMicrobiology pre- and post-lab quizzes
6 percent	Take-home, formal, written case study assignment

*In lieu of post-lab quizzes, lab reports are assigned as post-lab exercises.

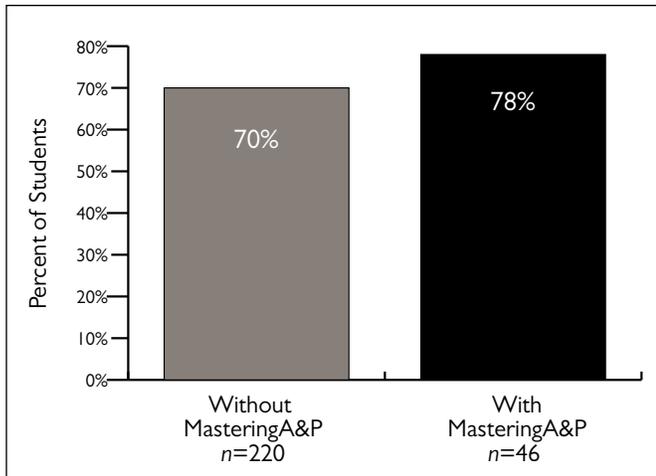


Figure 1. Average Student Pass Rate (A/B/C) with and without the Use of MasteringA&P

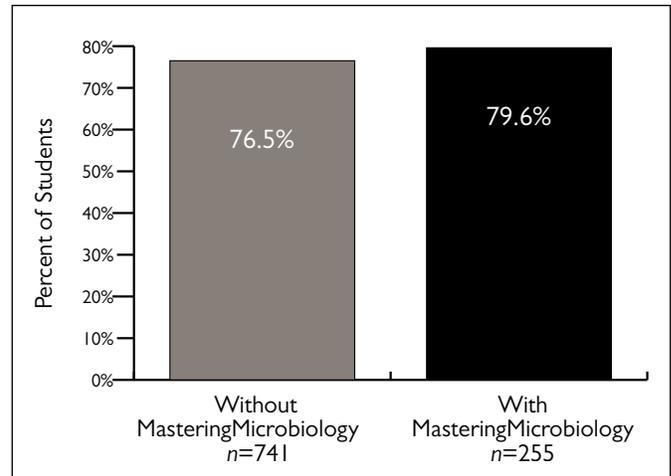


Figure 2. Average Student Pass Rate (A/B/C) with and without the Use of MasteringMicrobiology

Results and Data

After implementing Mastering A&P and MasteringMicrobiology, student pass rates (A/B/C) increased in both courses (figures 1 and 2). Note that homework and quizzes were always part of the course grades, so implementing Mastering learning technologies did not lead to grade inflation.

In addition, there were positive changes in student retention:

- After implementing MasteringMicrobiology, the average withdrawal rate fell from 8.9 percent to 7.8 percent—a decrease of 1.1 percentage points and about a 12 percent decrease between pre- and post-Mastering implementation.
- After implementing MasteringA&P, the average withdrawal rate fell from 6.8 percent to 6.5 percent—a 4.4 percent decrease.

Additional retention data relates to student attendance. At Florida State College, faculty may issue a failure for nonattendance grade (FN). In my course the policy is that students with more than three absences earn an FN grade.

- Prior to implementing MasteringMicrobiology, the course FN rate was 4.2 percent. After implementation, the FN rate fell to 1.2 percent (a 71 percent decrease between pre- and post-implementation data).
- Prior to implementing MasteringA&P, the course FN rate was 5 percent. After implementation, FN rate fell to 4.3 percent (a 14 percent difference).

The Student Experience

Student feedback for both MasteringA&P and MasteringMicrobiology has been overwhelmingly positive. In a spring 2013 survey, the majority of student respondents believed that assignments in Mastering helped them to prepare for class, exams, and lab (figures 3–5); and to better understand lab concepts (figure 6).

Questions on the end-of-course, spring survey also revealed that:

- 67 percent of respondents believed they would not have done as well in the course without Mastering.
- 93 percent of respondents agreed that Mastering helped them to think critically.

Student comments about Mastering include:

- “Mastering gave me multiple ways to learn the material and then gave me interactive resources to help me understand the concepts.”
- “I wasn’t simply learning so I could take a test, I was learning so I’d be able to apply it.”
- “Using Mastering is like having a professor at home who presents the material in an engaging way.”
- “I loved using Mastering. It helped me in this class and in other classes, too. I tell all of my peers to make sure, or at least hope, that their teacher has this program in their class.”

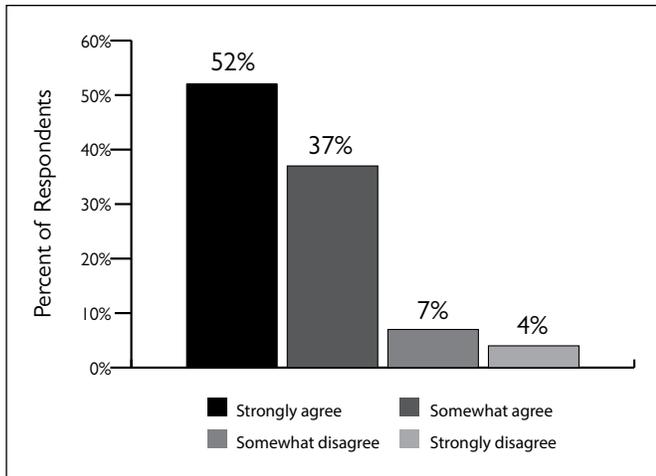


Figure 3. Combined MasteringA&P and MasteringMicrobiology Student Survey Results: "Mastering pushed me to prepare for class," Spring 2013

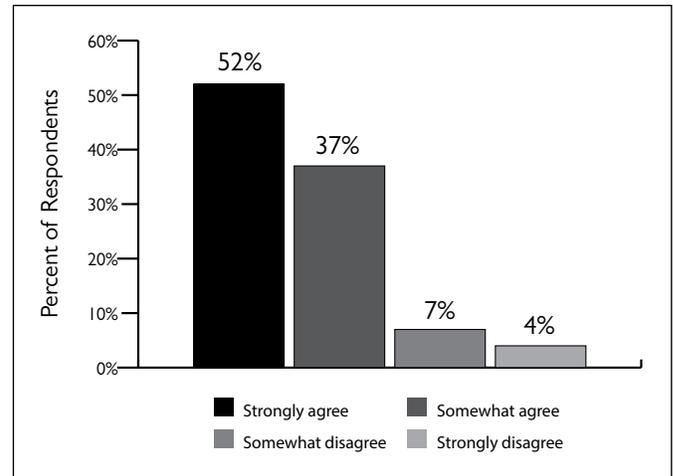


Figure 4. Combined MasteringA&P and MasteringMicrobiology Student Survey Results: "The content in Mastering helped me to prepare for my exams," Spring 2013

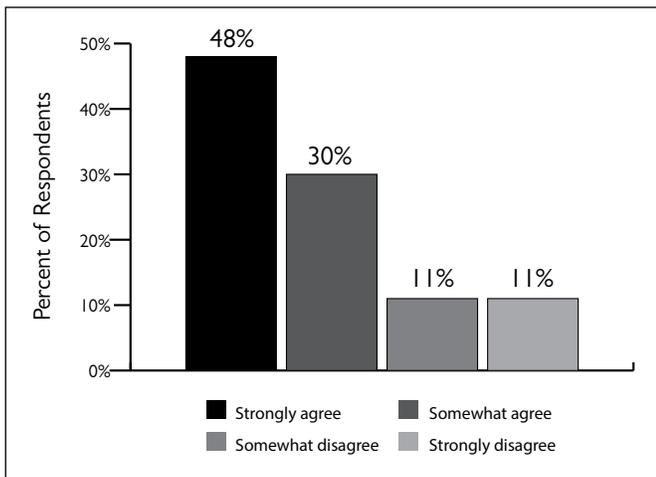


Figure 5. Combined MasteringA&P and MasteringMicrobiology Student Survey Results: "Mastering helped me to be better prepared for lab," Spring 2013

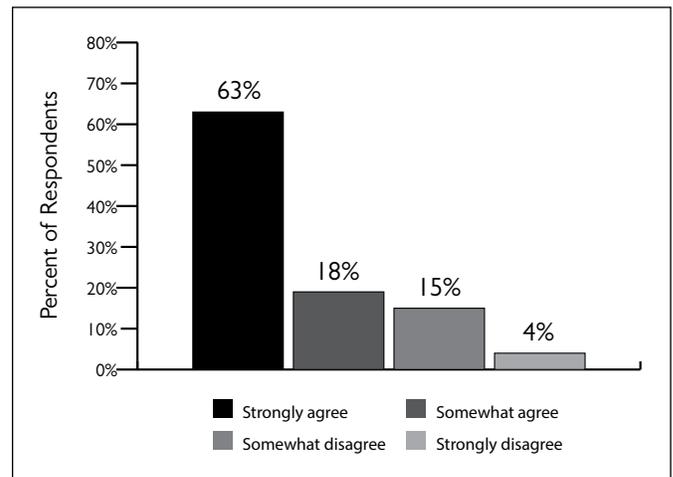


Figure 6. Combined MasteringA&P and MasteringMicrobiology Student Survey Results: "Knowing that I had a pre- or post-lab Mastering quiz pushed me to understand, not just perform, the labs," Spring 2013

Conclusion

As instructors, we often ask ourselves what more we can do to help students learn. Sometimes the best answer is to make students do more on their own. Mastering offers students multiple opportunities to understand course material and because feedback on homework is instantaneous, students can determine exactly what concepts they need help on earlier than when I hand-graded homework.

Students come to class more prepared and thereby are more able to focus on higher-order material. The enhanced student preparedness and engagement also frees class time so that my teaching time centers more on practicing the kind of critical-

thinking skills that will help my students achieve their long-term goals.

In addition, the student learning outcome data gathered in Mastering help me improve my craft as a teacher. By continually evaluating course results and student attainment of learning outcomes, I engage in a cycle of reflection and improvement that ensures that I'm meeting my course learning objectives.

*Submitted by Lourdes Norman-McKay, Ph.D.
Florida State College at Jacksonville*