University of Central Florida
Orlando, Florida

Case Study

Students' Retention Improves for Cumulative Final Exams while Grade Averages Increase with *Connect SmartBook*® and *Prep for Microbiology*

Because General Microbiology is a required course and a prerequisite for more specific courses for all Biomedical Science students, Dr. Camilla Ambivero wanted students to better understand course material and to apply their knowledge during the semester and in future courses.

After Ambivero and her colleague implemented *Connect* Microbiology with *Prep for Microbiology* and *SmartBook*, students were required to complete homework assignments for grades.

Digital Product in Use: *Connect*® Microbiology

LMS Integration: Canvas

Course Name: General Microbiology (MCB 3020)

Course Type: Face to Face / Lecture and Lab

Credit Hours: Five

Program in Use: *Prescott's Microbiology*® 11th edition of Willey/Prescott: Joanne Willey, Kathleen Sandman and Dorothy Wood with SmartBook® from McGraw Hill (ISBN: 9781260211887)

Instructor: Dr. Camilla Ambivero

Enrollment: 250 students per section; 2 sections; 1,400 year (university total)

Implementation Study Term: Summer 2016, Fall 2016, Fall 2017 and Summer 2018, Fall 2018, and Summer 2019

> **Take your time thinking about your students and the course. What do you expect them to know coming in vs. leaving? Connect can help you meet those goals.**

Students were better able to focus their studies on preparing for exams, and overall class average improved by approximately 2%.

Ambivero says, “Exam grades have increased or stayed the same, while the final exam scores have increased over the semesters. These results show that students are mastering the material and able to recall the information long-term.”

Students agree. One student advises, “Do the homework well in advance and do the work. Don’t just look up the answers. Read the book and do the self-study questions. The more you review, the more prepared you will be for the exams.”

Implementation

The following determines the course grade:

- Exams 50%
- Homework (SmartBook and Prep for Microbiology) 12.5%
- Lab Component 37.5%

At the beginning of the semester, Ambivero includes an assignment that is equal to one-third of students’ homework grade in *Prep for Microbiology* covering chemistry and biology basics. She says, “I give the students three weeks to complete this assignment at the beginning of the semester to ensure that all students are up to the same level of required knowledge.”

Throughout the course, Ambivero gives *SmartBook* assignments for each chapter covered, and students are required to complete those assignments before the exam. She reminds students that it is in their best interest to do the homework as the course progresses and not wait until the last minute. “Most students who succeed and score well above the average complete the assignments throughout the course,” Ambivero says.

Students are assigned two *SmartBook* assignments per week that are due the night before an exam, and students are responsible for three to four chapters per exam. Each chapter varies from 5-15 points, but all points are totaled into a pool of points. Each assignment should take about an hour to an hour and a half to complete.









Ambivero notes, “In general microbiology, cell growth, specifically cell wall synthesis, is a challenging topic. The book and the animations help students comprehend the material.”

Ambivero uses data in available reports to review and re-work slides if she notices students have struggled in the homework and exams. In the *SmartBook* reports, Ambivero uses the “Practice Quiz” reports, the “*Connect* Insight Dashboard” and the “At-Risk Report” in *Connect*. The “At-Risk Report” helps identify students who may need extra help. Ambivero says, “Since I only use completion grades for *Connect*, the at-risk report helps me identify students that I may want to talk to. A few are high achieving students who just do not spend a lot of time on *Connect*, but most are average and below students. It does not make much sense before the first exam, but it helps with the following exams.”

Ambivero says *Connect* allows her to redesign individual sections of the course. She can trust that students will learn some of the material in *Connect*, so she’s able to focus more of her time and resources on topics that are harder to grasp.

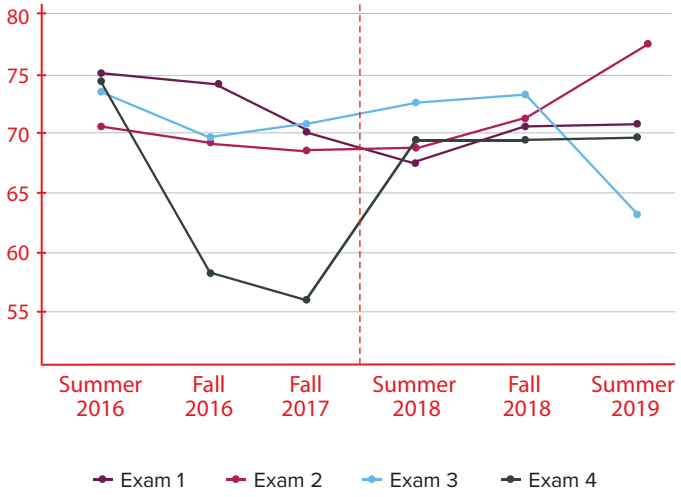
She says, “I now hold students more accountable than before. I do not spend time reviewing terms and defining them in class. I expect students to come to class with some sort of previous knowledge of the material, and we will apply it in class.”

Results Achieved

Ambivero compared exam data collected during Summer 2016, Fall 2016, and Fall 2017 semesters prior to homework being implemented as a completion grade versus data collected after homework was implemented as a completion grade during Summer 2018, Fall 2018, and Summer 2019 semesters.

After *Connect* Microbiology with *Prep for Microbiology* and *SmartBook* implementation, final exam scores have increased over the semesters. *Connect* homework implementation is at the red dotted line (Figure 1).

Figure 1:
Exam Grades Over Time



Exams cover the following material:

- Exam 1 covers the introduction to microbiology with nomenclature, prokaryotes vs eukaryotes, and cell make-up.
- Exam 2 is cellular growth as well as control of microbial growth.
- Exam 3 is metabolism.
- Final exam is cumulative with an emphasis on immunity and pathogenicity.

Ambivero says, "The exam questions are a lot like the homework questions, and I have seen a decrease in 'complaints' about the disconnect of the class to exams since using *Connect* Microbiology with *SmartBook*."

Students' average grades improved over time. Prior to requiring students to complete homework in *Connect*, students' average grades ranged from 76.7 to 75 to 75.1 (Figure 2). However, after homework was required to be completed in *Connect* prior to an exam, students' scores improved and climbed steadily from 77.4 to 77.9 to 78.3 (Figure 2).

Before requiring homework, the class score average was 75.6; after requiring homework, the class average increased to 77.9 – an improvement of 2.3% overall (Figure 3).

Figure 2:
Average Grades Over Time

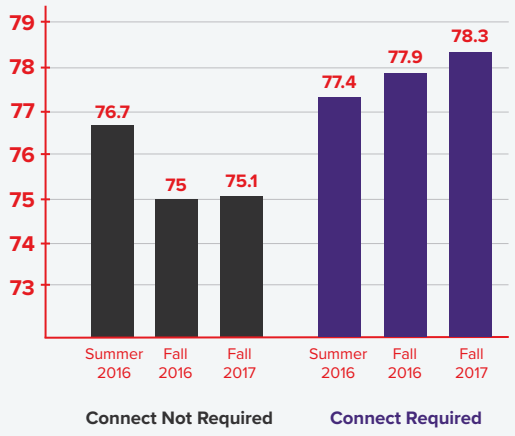
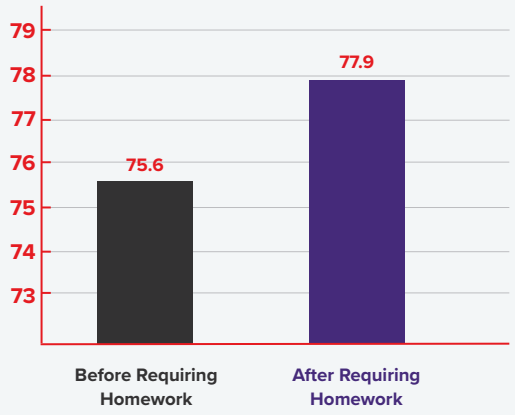


Figure 3:
Class Average Scores



> **Connect Microbiology with Prep for Microbiology and SmartBook is easy to use; students can easily access it, quickly learn how to get to the material and questions along with any help needed.**

Conclusion

When asked to share suggestions that might assist peers, Ambivero answered, "Make sure you explain to students why you are doing this. I had to add a slide with before vs. after homework grades to push students to buy-in. I was still getting students complaining that there was no point to the homework - until they saw the data." Ambivero worked closely with her Learning Technology Representative during the transition to *Connect*. "Our Learning Technology Representative took the time to explain everything to my colleague and me. My colleague has been teaching this class for almost 50 years and with the same book for probably two decades. It was hard at first to discuss a change, but when they showed the information and how easy it is, and how it helps students, it made the transition easier," Ambivero adds.

After implementing *Connect* Microbiology with *Prep for Microbiology* and *SmartBook*, students completed homework more consistently and earned higher scores on exams, including cumulative final exams. Overall, the class score average improved from 75.6 to 77.9 – an increase of 2.3%.

Ambivero says, "*Connect* Microbiology improves students' overall retention of material. Over the last three course periods, class performance improved consistently with homework incorporated as a grade for completion. More completed homework leads to higher exam grades and improved performance on cumulative final exams."

Get in Touch

We share your passion for learning and we believe that all students should have access to affordable, high-quality learning solutions built to help them succeed.

mheducation.com





Instructor Biography:

Camilla Ambivero has been at the University of Central Florida since 2003, where she completed her undergraduate and graduate degrees and earned her Ph.D. in 2013. Her research interest is mitochondrial function and dysfunction and the effects on the cells and overall health. Ambivero teaches all three semesters, including three levels of microbiology (for majors, non-majors, and pre-nursing), as well as immunology and molecular biology. She's an Italian-Brazilian immigrant who moved to the United States when she was ten years old.

Instructor's Implementation Goals

- Improve students' long-term retention of material
- Encourage students to complete homework as the semester progresses
- Improve students' exam scores by helping students better understand the material
- Reserve class time for discussion of challenging topics instead of reviewing basic terminology

Issues for Instructor Before Using Connect

- Students didn't take the previous assignments seriously
- Students' exam scores were declining
- Students didn't seem to retain material long term

Benefits to Instructor After Using Connect

- Students' exam scores improved
- Students' overall class average scores improved
- More time in class for discussion and application of material
- Students seem to be retaining material long term

SPOTLIGHT

Institution Profile:

The University of Central Florida, founded in 1963, is a suburban, public institution with an undergraduate enrollment of approximately 59,000 students. Based in Orlando, UCF offers more than 220 degree programs in 13 colleges over ten regional campuses. Researchers at UCF attract nearly $200 million annually in grants, gifts, and sponsored awards, where 956 patents have been secured.

Course Description:

General Microbiology is an introductory course in microbiology for science and pre-professional majors designed to familiarize students with the fundamental concepts of microbiology and the specialized techniques necessary to study microorganisms. The laboratory exercises are designed to develop an ability in the student to carry out the specialized techniques associated with the isolation, cultivation, microscopic examination, and the identification of diverse groups of microorganisms. Attempts will be made throughout the course to use examples that not only illustrate fundamental concepts but also demonstrate to the student the importance of microorganisms to the welfare of all humans. The class objectives are in line with the American Society of Microbiology (ASM).