

Product Name **MasteringChemistry**

Course Name **Principles of Chemistry**

Credit Hours **Three**

**Key Results** By completing MasteringChemistry tutorial homework assignments and timed end-of-chapter quizzes, students learned course content and improved their test-taking skills, resulting in an increase in As, Bs, and Cs.

## Text

*General Chemistry: Principles and Modern Applications*, 10e,  
Ralph H. Petrucci, F. Geoffrey Herring, Jeffrey D. Madura,  
Carey Bissonnette

## Implementation

This is a traditional face-to-face class with a lecture and lab. Nearly all science majors and a large portion of engineering students take this course. As a result, classes are a melting pot of experiences and attitudes—from chemistry majors to students who dread chemistry.

In 2007, my first semester teaching the course and my first semester using MasteringChemistry, I gave students 8 percent credit for MasteringChemistry homework. In 2009, I increased the course credit for MasteringChemistry to 10 percent.

I give one MasteringChemistry homework assignment each week and specifically choose tutorial-type questions, since I want struggling students to see the homework assignments as instructive and real practice. (Plus, some of them are fun!) Students don't lose points for hints, but can earn bonus points if they answer a question correctly without using hints.

From 2007 to 2009, I received complaints after the first midterm. Students said they did well on the homework assignments and did the practice exam, but didn't do well on the midterm. Looking over their midterms, I saw that these students lost significant points because they ran out of time. They hadn't learned time management as it pertains to testing versus studying and were unaware of how long it took them to complete a question.

I reviewed the MasteringChemistry time diagnostics with my students. Some were shocked to find out that they sometimes spent more than 20 minutes on a single problem (that other students finished in less than 10 minutes). Students were studying hard, but weren't taking into account the ticking-clock factor of timed tasks like the midterm.

In fall 2010, I changed the grading system on midterms and the final exam. I now use a "one-point-per-minute" rubric to indicate to students how they should budget their time. For example, a five-point problem should take the average student about five minutes to complete. For an 80-minute midterm, I assign 50 points to allow plenty of extra time for slower students or to review and revise answers. I also changed from giving three midterm exams to giving two.

My final change was introducing a MasteringChemistry timed quiz, approximately one and a half weeks before the first midterm. I simulate a dry-run for the test by selecting three problems from the end-of-chapter questions. Students have exactly 30 minutes to complete the quiz, which is made available for 24 hours on a predetermined date. I use the time diagnostic in MasteringChemistry to ensure that the average student can feasibly finish within that time frame.

I implemented the first timed quiz in October 2010. Student comments on the very next day were exactly as predicted—overwhelmingly, it was an eye-opening experience for them. The class average on the quiz was only 45.3 percent, with most completing the first question but getting only about halfway through the second. In 2011 in response to popular demand from students, I added a second timed quiz before the second midterm. This second quiz was treated like a real practice run for the second midterm.

## Assessments

30 percent	Final Exam
30 percent	Midterms
25 percent	Lab
10 percent	MasteringChemistry homework and quizzes
5 percent	Participation

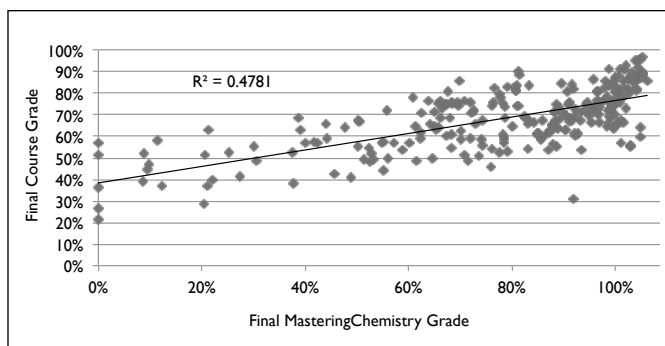


Figure 1. Correlation between MasteringChemistry Homework and Quiz Scores and Final Course Grades, 2007 ( $n=263$ )

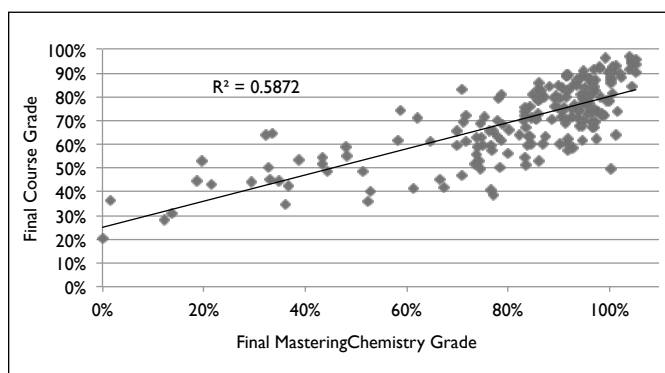


Figure 2. Correlation between MasteringChemistry Homework and Quiz Scores and Final Course Grades, 2011 ( $n=193$ )

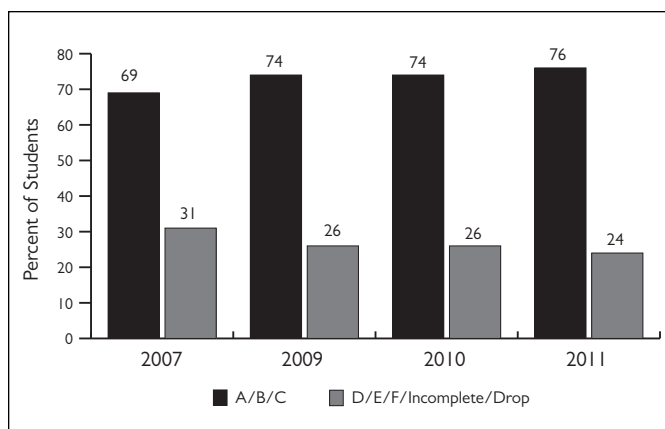


Figure 3. Principles of Chemistry Success Rates, 2007, 2009–11

## Results and Data

The combination of tutorial and timed end-of-chapter questions helps students learn, understand, and practice the course materials. The timed quizzes allow students to simulate actual test conditions and better prepare for the midterms and the final exam.

In analyzing the results from fall 2011, when students had both assigned MasteringChemistry homework and a timed MasteringChemistry quiz prior to each midterm, I found that the correlation of their MasteringChemistry grade to the final course grade was stronger than in prior years (see figures 1 and 2). In addition, during this period of time, I saw an increase in As, Bs, and Cs—a seven percentage-point increase in success rates, and a decrease in Ds, Es, Fs, and incompletes (see figure 3).

## The Student Experience

MasteringChemistry is an integral part of a course that is indispensable to my students. Student evaluation comments are largely positive towards the program—they mention its ease of use, the availability of hints, and the step-by-step breakdown of the questions. Their comments include:

- “MasteringChemistry assignments were quite helpful since they were a step-by-step way to go through all the subject matter during the week. The assignments were challenging enough, but not too strict in terms of marks.”
- “The timed MasteringChemistry quiz was a major wake-up call! I had no idea how long I was taking to solve problems. It really opened my eyes and helped me prepare for exams.”

## Conclusion

When I was hired to teach the course, MasteringChemistry was already in use by other faculty so I chose to “play along” and use it in my sections, as well. I quickly realized the value of the program.

I care deeply about my students’ performance and want each of them to succeed, but increasing class sizes make it impossible to have meaningful one-on-one contact with every single one. The most beneficial aspect of MasteringChemistry is its tutorial nature—students can read, learn, practice course problems, and seek help via hints when they are struggling. It’s as close as a computer program can get to me sitting beside them while they’re studying.

Submitted by Kathy-Sarah Focsaneanu  
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