

Product Name MasteringEngineering
 Course Name Statics for Mechanical Engineers, Dynamics for Mechanical Engineers, Dynamics for Civil and Biological Engineers
 Credit Hours Four (Mechanical), Three (Civil and Biological)

Key Results Because students are engaged by MasteringEngineering homework, they spend more time using it and develop more independent-learning skills. After only one semester, there was a strong correlation between homework scores and final exam grades, and student success rates improved.

Text

Engineering Mechanics: Statics and Dynamics, 13e,
 Russell C. Hibbeler

Implementation

I teach Statics for Mechanical Engineers, and two Dynamics courses, Dynamics for Civil and Biological Engineers and Dynamics for Mechanical Engineers. Topics covered in the statics course include coordinate systems, work-energy, impulse-momentum, and selected topics from three-dimensional rigid bodies. The course includes the use of computational software to solve numerical problems.

In both of the dynamics courses, topics include Newton’s laws, the work and energy principle, and the impulse and momentum principle. Students use computational software to solve numerical problems. There is an additional contact hour for Dynamics for Mechanical Engineers that enables us to cover additional content in that course.

Using homework to practice problem-solving is an important part of all three courses. I adopted MasteringEngineering in spring 2013 because it provides an easy way to assign homework, provides instructors with a pool of questions from which to choose, and offers students immediate feedback and assistance on their own time, outside of class as they complete their homework assignments. Previously, I assigned students paper-and-pencil homework that needed to be quickly hand-graded and returned in order for students to learn where they needed more practice.

Today I assign weekly MasteringEngineering homework. The assignment is timed, and I primarily assign end-of-section problems to ensure students understand the reading and concepts. I use the gradebook’s diagnostics to determine how well students performed on the homework and what issues they encountered.

Assessments

- 35 percent Final exam
- 30 percent Exams (three)
- 30 percent MasteringEngineering homework
- 5 percent Attendance

Results and Data

After evaluating my results for all three courses taught in the spring 2013 semester, I found positive outcomes for each.

After implementing MasteringEngineering, final course grades in Dynamics for Civil and Biological Engineers improved (figure 1):

- The percent of As and Bs increased by 18 percentage points—from 20 percent to 29 percent for each grade.
- The number of Fs decreased by 20 percentage points—from 20 percent to zero.

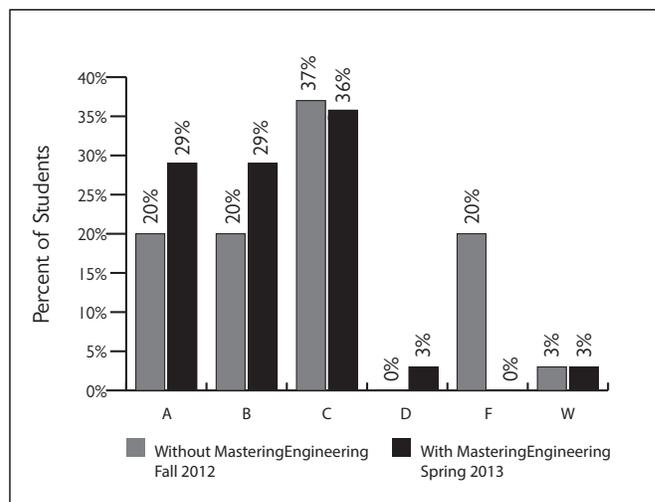


Figure 1. Grade Distributions, Dynamics for Civil and Biological Engineers, Fall 2012 (n=29) and Spring 2013 (n=31)

“Since implementing MasteringEngineering, fewer students come to office hours and the majority of students come to class better prepared.”

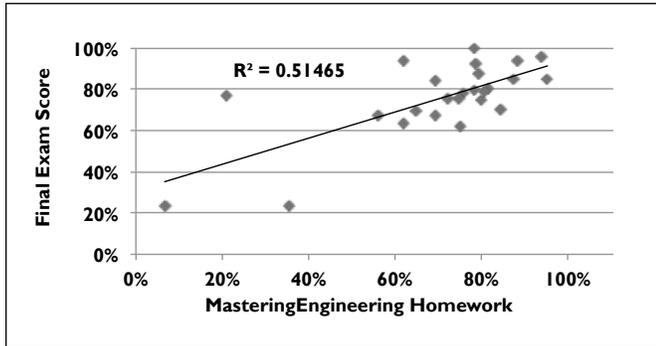


Figure 2. Correlation of MasteringEngineering Homework Score to Final Exam Score, Statics for Mechanical Engineers, Spring 2013 (n=25)

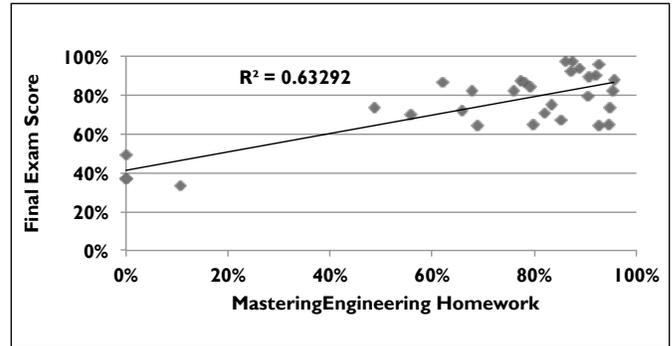


Figure 3 Correlation of MasteringEngineering Homework Score to Final Exam Score, Dynamics for Mechanical Engineers, Spring 2013 (n=32)

I don't have course grades from before implementation of MasteringEngineering for the Statics and Dynamics courses for Mechanical Engineers, but using my Spring 2013 results I was able to discover a strong correlation between a student's MasteringEngineering homework score and cumulative final exam score (figures 2 and 3).

The Student Experience

I asked my students what they liked best about using MasteringEngineering. Their responses included:

- “The help it provides and having multiple attempts to solve a problem. If I get a question wrong, I have the opportunity to understand why I got it wrong and how to approach and solve the problem the next time I am faced with it.”
- “The online aspect of completing my work. It kept me on my toes as far as checking for new assignments (great business preparation).”
- “That it gave me feedback on answers to let me know whether or not I was on the right track.”
- “The calendar because it was easy to see when my assignments were due.”
- “How it explained conceptual material to me once I'd answered a problem.”

Conclusion

Homework is an integral part of the Statics and Dynamics courses. Students seem to be more engaged with the course content when doing homework in MasteringEngineering and they appreciate the hints and immediate feedback. In addition, since implementing MasteringEngineering, fewer students come to office hours for help and the majority of students come to class better prepared. Because of the positive results I've seen in my first semester of use, I will continue to use MasteringEngineering.

*Submitted by Paul Akangah
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