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The Impact of Adding Online Homework Assignments to an Introduction to Physical Geology Class

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As instructors we are constantly looking for ways to improve student performance in the classroom. In an attempt to improve student performance in my GEOL 105 – Introduction to Physical Geology class, I added online homework assignments from the Pearson Mastering Geology program beginning in the Fall semester of 2014. There were several anticipated advantages to the online homework approach. If a student is struggling with a question they can get hints that don't tell them the answer, but are designed to stimulate their thinking and lead them towards the correct answer. The students also know immediately after submitting their answers which questions they got right and which were wrong, and they can go back to the wrong answers and try to determine the correct answer so they know what it is. This gives them much more rapid feedback than traditional paper homework, all of which makes this a more student-centered approach to learning. It is also my hope that the students find the online homework more interesting and interactive than paper-based homework, which I hope in turn will stimulate the students to be more likely to do the homework and take it seriously while also having some fun while doing it.

As of the end of Fall semester 2016, I had been using the online homework assignments in my classes for three years. Therefore, I analyzed student performance in the three years prior to adopting the online homework and compared it to performance over the three years since adopting online homework. In the three years prior to adopting the online homework, the average grade in my classes was 73.8%; afterwards the average grade was 81.3%, for an improvement of 7.5% on average. Most of that improvement was in average test scores, which increased by 6.3% (67.4% prior to 73.6% after). The online homework did not improve the performance of the top students, but it did improve the performance of the other students. Prior to adopting the online homework, grade distribution in the class was 15% A (90-100% scores), 32% B (80-90%), 19% C (70-80%), 19% D (60-79%), and 15% F (<60%). After adopting the online homework, the grade distribution was 13% A, 48% B, 24% C, 13% D, and 2% F. Therefore, students who either passed the class but didn't excel or who struggled with the class prior to online homework adoption saw improvements in their performance, while students who showed truly outstanding performance remained constant. Test grades showed a similar trend. The average test scores for those who received an A in the class were 88.0% prior to and 88.6% after adopting the online homework, while test averages for students who received less than an A were 63.9% prior to and 71.4% (7.5% improvement) after adopting the online homework.

I am always making small changes to my classes in an effort to improve them, but the only major change made to the class over the time period covered in this study was replacing paper homework assignments (which were not graded) with the online homework assignments. In addition, there was no statistical difference in scores in the Introduction to Physical Geology Laboratory over the same period (87.8% average before adoption, 85.7% after adoption). Students are required to take the lecture and laboratory at the same time, so the student populations were identical. The online homework applied to the lecture, where grades improved, but not to the laboratory, where grades remained consistent. Therefore, it was concluded that the addition of online homework to the Introduction to Physical Geology class had a strong positive effect on student scores. While students who would excel regardless of the format (those who received A grades) showed the same performance under both class formats, those who fell farther down the grade scale showed significant improvement with the use of the online homework assignments.

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