

Students' Performance and the Effect of Blackboard on Introductory Physics Courses

H. R. Kobraei
Professor, Department of Engineering and Physics
Murray State University
Murray, KY 42071
hamid.kobraei@murraystate.edu

Abstract:

We have collected data on students' performance and their weekly homework activities for the past eight years in several classes. Specifically, we have considered the first algebra-based introductory physics course. We have data on weekly activities of students since 1997. Every week, homework assignments have been given to students in this class and later collected and graded. Basically, we have kept the same office hours for students that were seeking assistance. Because of various reasons, we see only a certain percentage of students looking for help during our regular office hours. This year for the first time, we used Blackboard to accomplish the same task. As a result, we have data to compare the effect of one of the electronic medium, i.e. Blackboard, to the usual way that this program was conducted in the past. Using the communication capabilities in Blackboard, we emailed the students the list of problems and their due date every Thursday and also made it available in the announcement section of Blackboard.

Introduction:

Solving problems that involve applying the principle of physics are very important for understanding the physical concepts. In addition, they are a good way of gaining problem solving techniques. Textbooks in physics typically have many conceptual and analytical/numerical problems at the end of each chapter. We have always included weekly homework assignments as an integral part of our courses. We believe students will gain many valuable experiences from doing weekly assignments which goes beyond just understanding how the physical concept applies to real world problems. Handling assignments also teaches the student time management, understanding deadlines, responsibilities, and mathematical skills.

The Physics 130 and 132 sequences are our algebra-based introductory physics courses. These two classes are required for all students in the College of Science, Engineering and Technology except students majoring in Engineering or Physics. Our majors take the calculus-based sequence of the same courses. For this study, we have focused our attention only on Physics 130 which is basically classical mechanics.

The lecture part of Physics 130 is three hours and the laboratory is two hours per week. A typical Physics 130 class has an average of 60 students. Often we have more than one section of this course offered in the Fall semester. Parallel sections are taught by different instructors. There is not an obvious coordination among faculty teaching different Physics 130 sections; although we do use the same textbook and basically cover the same amount of materials in our classes. We usually introduce and incorporate many examples in our lecture classes. Moreover, students are required to concurrently take the related laboratory class (Physics 131) which is coordinated closely with the lectures. Every week between eight to ten problems are assigned as homework.

Students have one week to complete the assignment. On their due date, the assignments are collected and then graded. Although we have collected data on weekly activities of students since 1995, for comparison, we have used only the data from Fall 2001, Fall 2002, Fall 2003, and Fall 2005. I did not teach Physics 130 course in the Fall of 2004. In my Physics 130 classes, homework assignments average counts as 20% of a student's overall grade.

Assignments:

Every Friday, eight to ten problems from the end of the chapter homework is assigned and are due on the following Friday. Before utilization of the Blackboard, students have only access to answers of odd-numbered homework assignments which are typically shown at the end of their textbooks. And if anyone was absent on Friday, would not have found out about the assignment until much later time. A Teaching Assistant usually grades homework assignments and returns them to me where the results are kept in a spreadsheet. A typical semester usually involves between eleven to fourteen sets of homework assignments.

Analysis and Comparisons:

In Fall of 2001, I had 63 students that completed the course. The students whom dropped or audited the class are not considered. During the semester, a total of fourteen homework sets were assigned. However, the last set was not graded. In Figure 1, the average homework grade of all students for each week throughout the semester is depicted. On the legend, Fall of 2001 is referred to as Series 1.

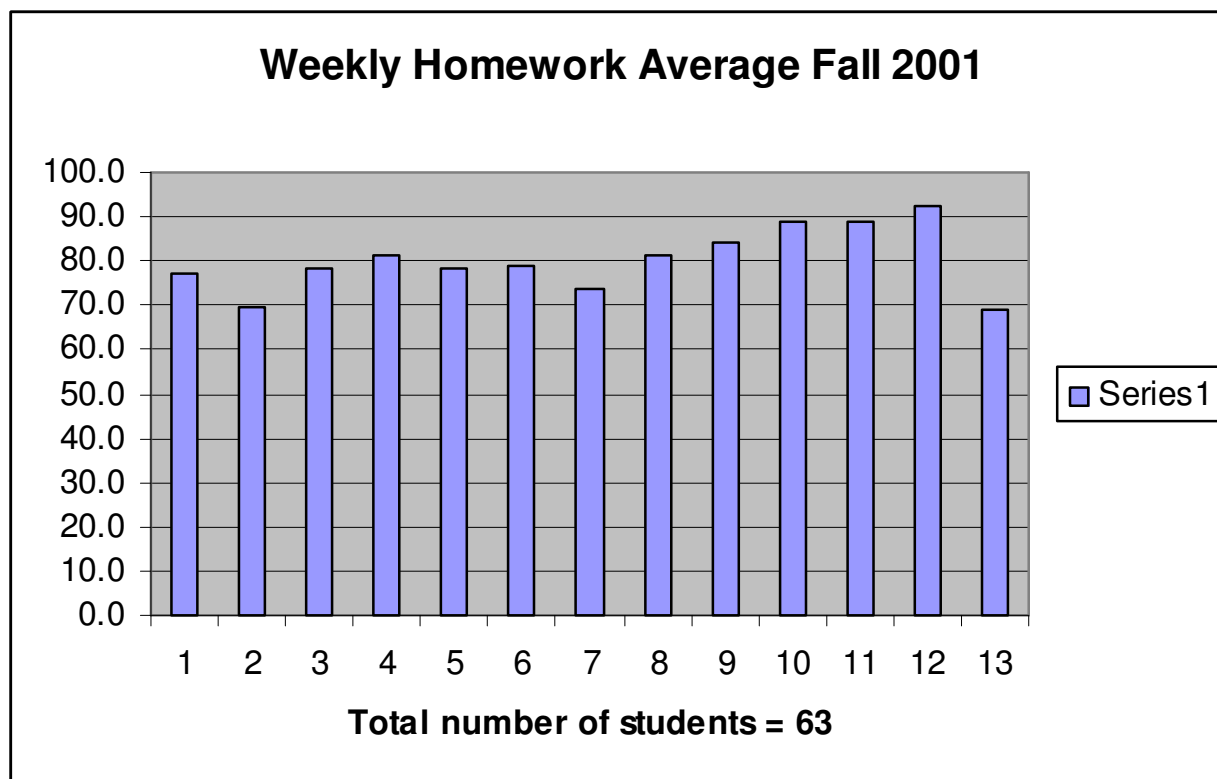


Figure 1

Seventy-nine students completed my Physics 130 section in Fall of 2002. In Figure 2, the average homework grade of all students for each week throughout the semester is depicted. On the legend, Fall of 2002 is referred to as Series 1.

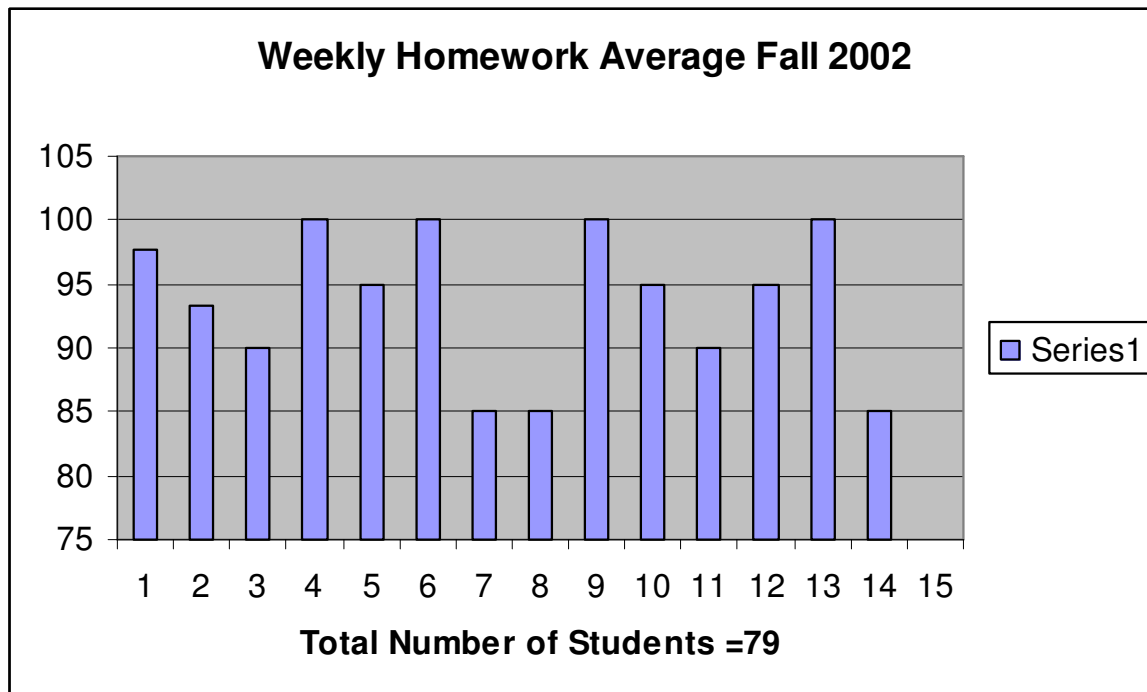


Figure 2

A total number of 74 students completed Physics 130 in Fall of 2003. In Figure 3, the average homework grade of all students for each week throughout the semester is shown. On the legend, Fall of 2003 is referred to as Series 1.

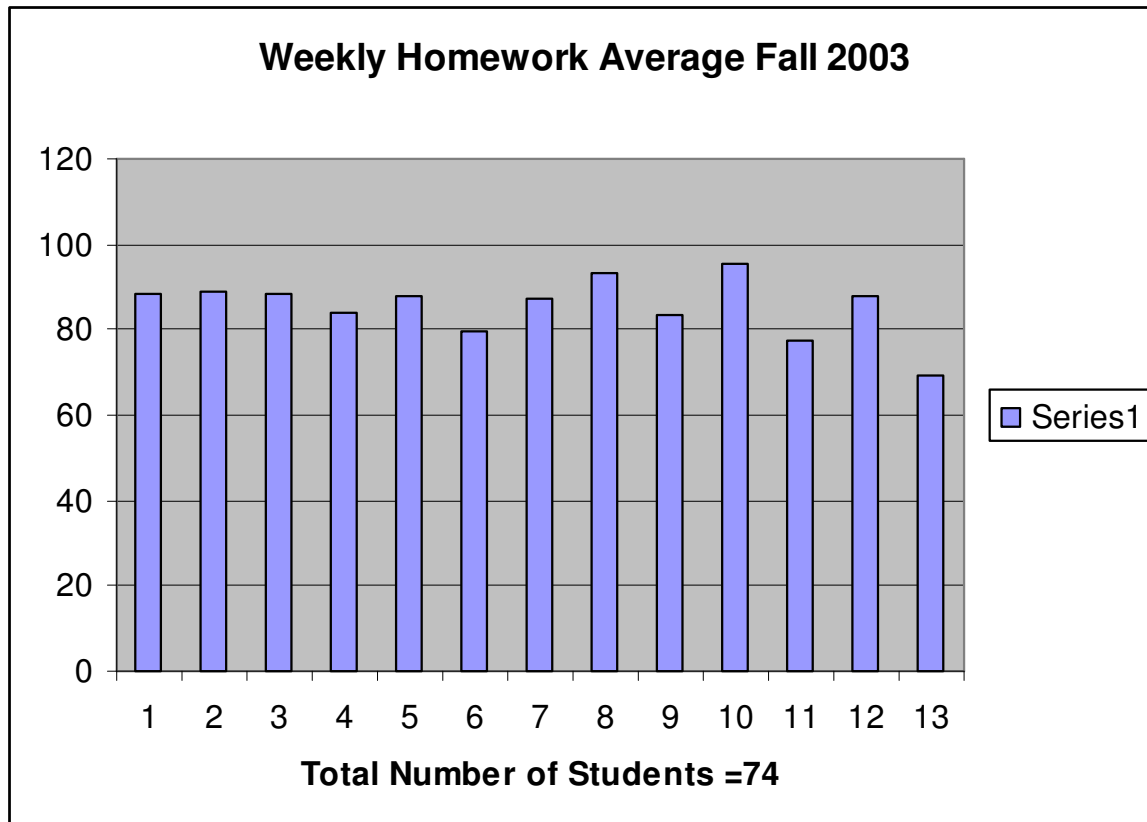


Figure 3

Although, Blackboard was utilized in our other classes before, in Fall 2005, for the first time, I used the Blackboard for posting assignments and communicating with students. Just like previous years, every Friday a new set of homework assignments were posted along with their due date and answers to even-number problems. In Figure 4, the average homework grade of all students for each week throughout the semester is depicted. On the legend, Fall of 2004 is referred to as Series 1.

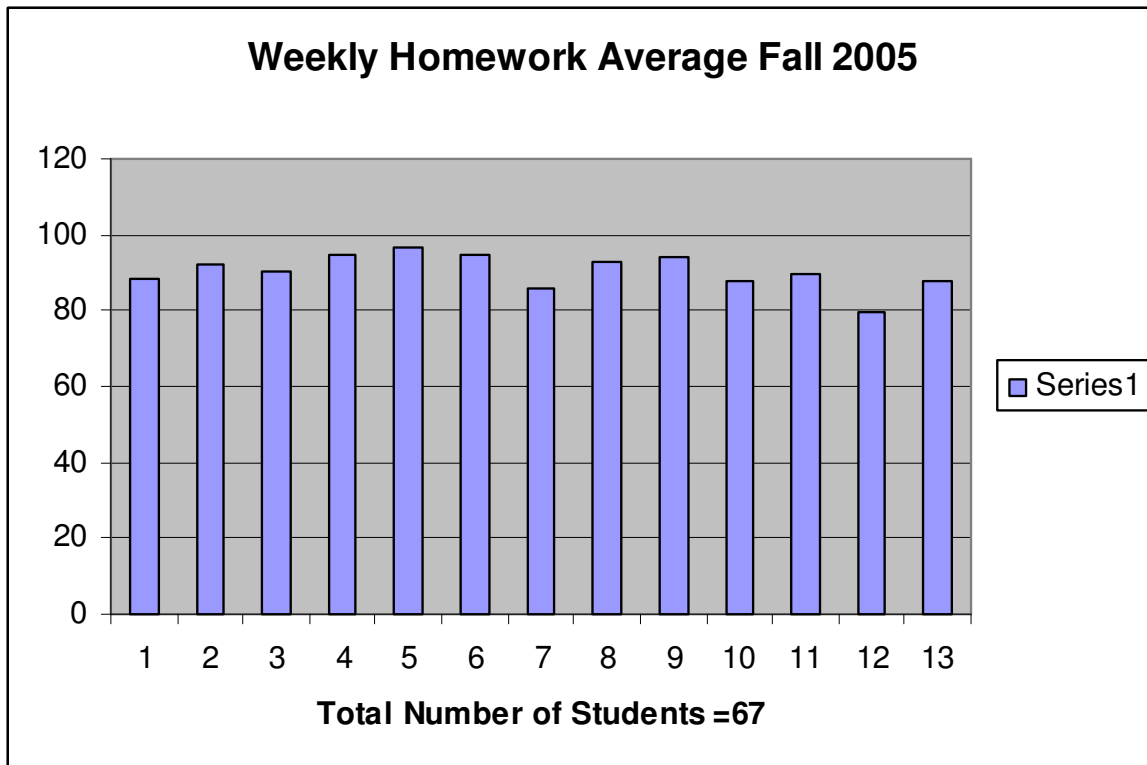


Figure 4

Prior to the Fall of 2005, some students would have checked their results of the assignments by showing up during office hours. One obvious advantage of the Blackboard is that now all the students have access to the correct answers to all homework assignments so they can compare their results. The data we have shown, that overall, students have performed better than average in the last three years. Moreover, the percent of students finishing their assignments was highest among all four years considered here. In Figure 5, the average homework grade of all students for each week throughout four semesters is depicted. On the legend, Fall of 2001 is referred to as Series 1, Fall of 2002 is Series 2, Fall of 2003 is Series 3, and Fall of 2005 is Series 4 respectively.

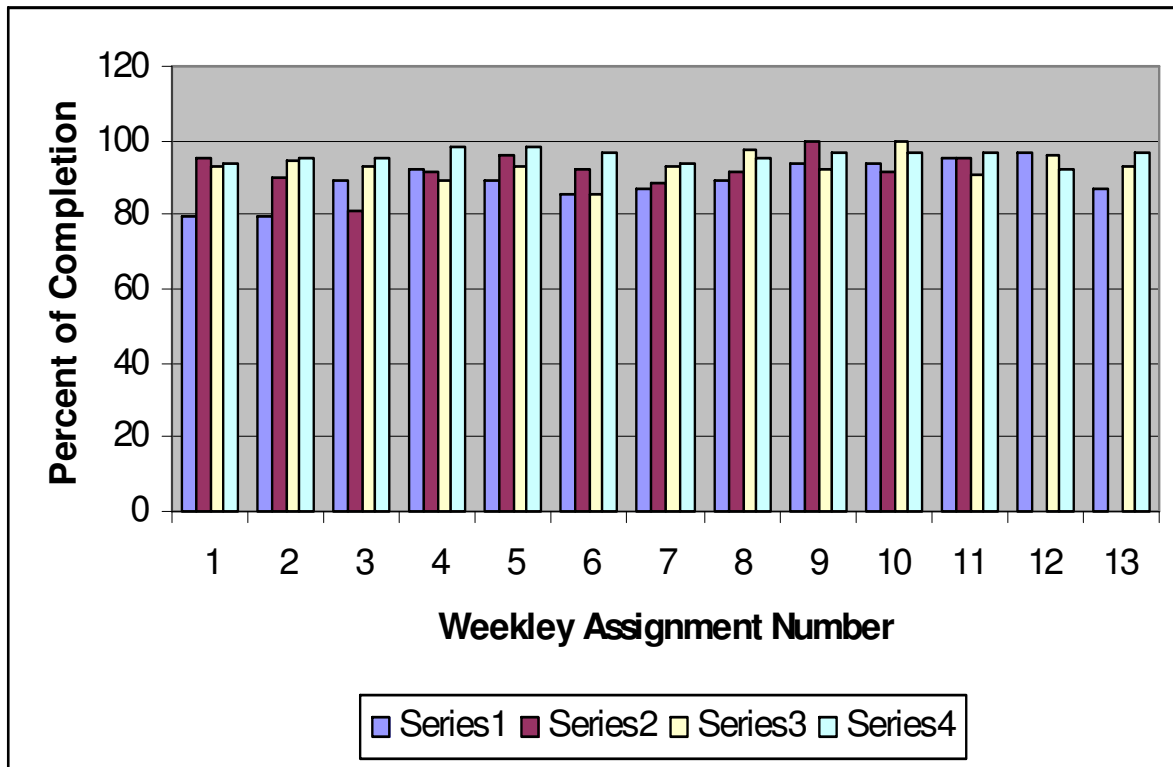


Figure 5

The overall average of homework averages of each semester (Series 1) and percent of overall completion for all students in each semester is shown in Figure 6.

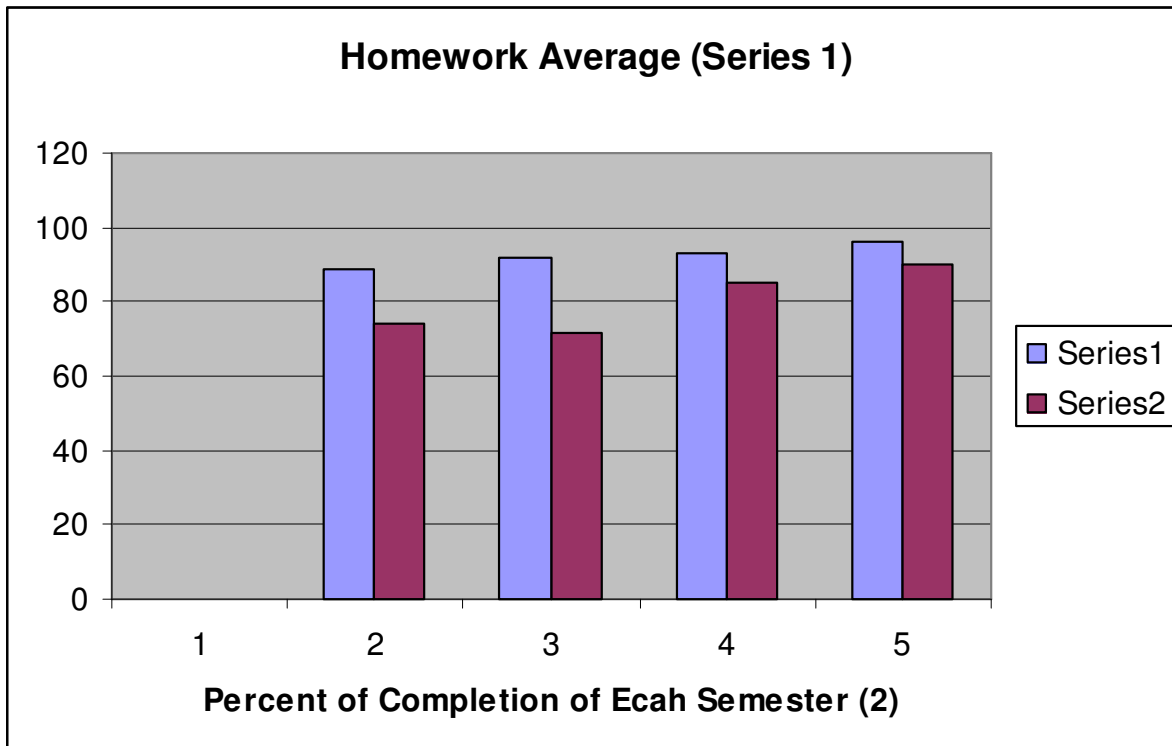


Figure 6

I will continue to use Blackboard in my Physics 130 class and believe that the least advantage of employing it is the convenience and access that it provides for students. At the end, the outcome of each class still depends on quality of instruction and how much time and effort individual students are ready to invest. However, at the age that there are so many different things competing for student's time and attentions, any thing that can help students to focus and facilitate their learning will be very helpful.