Does Homework Really Matter for College Students in Quantitatively-based Courses?

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ABSTRACT
This investigation was initiated by two students in an Advanced Computer Applications course. They sought to examine the influence of graded homework on final grades in quantitatively-based business courses. They were provided with data from three quantitatively-based core business courses over a period of five years for a total of 10 semesters of data. The results indicated that graded homework grades were highly correlated with final course grades, but the paired t-test showed significant difference between the graded homework and final course grades. The R-squared value of .463 showed that graded homework accounted for a significant portion of the final course grade. This finding is important as instructors search for pedagogy that can positively impact final grades and facilitate necessary and timely progress toward graduation.

Keywords: homework, automaticity, practice, quantitatively-based courses, chunking

INTRODUCTION
This study was initiated by two students in an Advanced Computer Applications class who decided to study the influence of graded homework on final grades as their course research project. They had observed that students who completed their homework had better grades in their classes, but they wanted to statistically support this claim. And as the instructor, I concurred that the assumption was, in all likelihood, correct and provided them with several semesters of data. By investigating the data from multiple perspectives, they exposed some interesting results. As college students are entering higher education, increasingly unprepared or under-prepared, pedagogical techniques that can positively impact their learning need to be carefully examined. It is imperative that faculty continually explore ways to promote student learning and their progress toward graduation. Student retention and higher education graduation rates have become an urgent issue for students, parents, politicians, employers, and instructors.

LITERATURE REVIEW
Importance of Practice
The importance of assigning homework as a tool for practice continues to be debated at many levels of education. Refer to the meta-analysis conducted by Cooper, Robinson, and Patall (2006) for synthesis of research on homework. However, whether it is a baby learning to walk or a professional athlete honing his or her talents, practice is essential for them to master their skills. To be an accomplished musician or athlete means hours of practice.
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Homework and the College Student

Although there are numerous articles on the impact of homework on final course grades for college students, their methodologies are quite disparate. (Alsosary, 1995; Bembenutty & White, 2013; Kitsantas & Zimmerman, 2008). Many of the studies included in the literature review found that there were significant only at the .10 level (t = 1.744, df = 28, p < .10). Their conclusion was that homework assignments are better predictors of final course grades than those not receiving homework assignments. The findings of the t-test for the posttest results were significant only at the .10 level (t = 1.744, df = 28, p < .10). Although much of the homework was not of high quality, it still accounted for approximately 10% of the overall grade. (D’Souza & Kelwyn, 2010). Galyon, Blondin, Forbes, and Williams (2013) examined the influence of critical thinking and accuracy as well completion of homework on final grades. Ten questions were selected from each chapter assigned in the text. Students completed the assignments and earned one point for each correct answer. Their findings were “Overall, accurate homework completion showed promise as an intervention target for improving student performance and, at times, raised critical-thinking ability as the primary predictor of exam performance” (p. 96). The study conducted by Cartledge and Sasser (1981) compared pretest and posttest grades based on students having no homework versus having weekly homework assignments in a college algebra course. The homework assignments were graded and returned to the students. Pretest and posttest were given to determine if students receiving homework assignments received higher grades than those not receiving assignments. “The findings of the t-test for the posttest results were significant only at the .10 level (t = 1.744, df = 28, p < .10). Indicating that students receiving homework assignments are better predictors of final course grades than those not receiving homework assignments” (p. 8).

METHODOLOGY

Many of the studies included in the literature review did not provide their definition of homework as used in their investigation. For the purpose of this study: homework is work assigned to be completed outside of class that provides an opportunity for students to practice and master the concepts under study. As noted in the litera-
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Nichole Young, Amanda Dollman, & N. Faye Angel

Mary G. Allen and Patricia M. Hatcher

rute review, the practice component is important to facili-
tate “embedding” the knowledge in working memory by becoming comfortable and familiar with it resulting in quick retrieval of chunks of information.

Limitations and Characteristics of the Study

As with all studies, this one has limitations and specific characteristics that define it. These are identified below for the purpose of placing the investigations into a clearer context.

1. All courses comprising the data set were taught by the same instructor.
2. The instructional method was similar for all the courses, e.g. problem-solving approach.
3. The homework was graded by the instructor.
4. Students repeating the course would be exposed to the same homework.
5. Students may complete homework and not submit it for a grade.
6. Students may receive assistance with homework from professor or other students.
7. Graded homework accounted for 5 – 10% of the final grade.
8. Five years of data for fall and spring semester from three quantitatively-based courses (Bus 331 Managerial Finance, Bus 330 Quantitative Methods of Management Science, and Bus 325 Advanced Computer Applications) were collected for a total of 554 cases.
9. The attendance rate, for the courses in the study, was very high and it was unusual for students to be absent. Most of the absences are considered “excused” and include such events as athletics and college-sanctioned activities.
10. The homework assignments were paper generated versus online homework.
11. Homework was emphasized and, on occasion, students were dismissed from class if homework was incomplete.
12. Data Set and Variables

The data set consisted of 10 semesters of grades for three quantitatively-based courses from fall 2010 until spring 2014. The three courses (listed above) were taught every semester by the same instructor. The number of cases was 554.

Dependent variable: Final course grade: scale (ratio)
Independent variable: Homework grade: scale (ratio)

Statistical Procedures and Results

Several statistical methods were used to analyze the influence of graded homework on final course grade. The results are provided below with a brief explanation of each.

Pearson r
A correlation test was performed to determine if there was a significant relationship between homework grade and final course grade. With a correlation of .680, the relationship between graded homework and final course grade was significant at p < .000.

Scatterplot
A scatterplot visually shows the relationship between the independent variable (graded homework grade) and the dependent variable (final course grade). It can be noted there is considerable variability around the regression line. Refer to Figure 1.

Linear Regression
Linear regression was conducted to determine the proportion of the final course grade that is influenced by homework grade. The regression model was: Y = 48.289 + .370x where Y represents the final course grade and x represents the homework grade. R-squared of .463 indicated that graded homework accounts for a significant portion of the final course grade.

Paired t-test
A paired t-test was conducted to compare the independent variable (homework grade) and the dependent variable (final course grade). It was assumed that there would be no statistical difference. However, the mean for the homework grade was 69.4041 and for final course grade was 73.3423. With a t = 4.382, the difference between their means were significant at p < .000.

Bar chart
This comparison by letter grade is displayed in a bar chart. Refer to Figure 2. With the exception of a letter grade of A (final course grade between 90%—100%), the homework grade was less than the final course grade.

Discussion

Although not just one factor contributes to a student’s final course grade, this study clearly indicates that graded homework plays a significant role in a student’s final course grade with an R-squared of .463. As shown in the results, homework grade and final course grade were highly correlated. This is consistent with extended practice via graded homework facilitating the chunking of new information, thereby, freeing up resources for other activities, such as critical thinking for test taking, completing a high quality, comprehensive projects, and improved decision-making. This positive impact of satisfactorily completing homework on final course grade is also shown in the scatterplot of homework grade in relation to final course grade. Refer to Table 1. However, those who did not earn a homework grade of at least 60% saw a major negative impact of their final course grade (final course grade of less than 60%). Refer to Table 2 for the bar chart that compares homework grade to final course grade. This chart shows that final course grade was higher than homework grade with the exception of the letter grade of A. The paired t-test showed that the means of the homework grades and the final course grades were statistically significant with the final course grade being the higher of the two. The authors noted from the results of the paired t-test that not only was increased accuracy of graded homework correlated with a higher final course grade, there was a greater than a 1.058 increase in the final course grade for every point scored on the homework grade. This finding implies that completing homework at a high level of quality is an efficient and effective tool for student learning as the correlation value of .662—the higher the homework grade, higher the final course grade.

A key to graded homework having a positive impact on the final course grade is for students to understand the importance of homework. It must be stressed by the faculty or graduate assistants responsible for the course. Recommendations for emphasizing the importance of homework include such activities as:

1. grade homework and return to the students,
2. make homework a proportion of the overall final course grade,
3. check homework at the beginning of class with appropriate consequences for uncompleted homework,
4. encourage students to see instructor for assistance with homework as needed,
5. schedule office hours to maximize the time that faculty are available for student assistance,
6. place a statement in the syllabus about the importance of homework,
7. explain the impact of homework on final course grade,
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The completion of homework at a high level is not only an efficient tool for facilitating mastery of the concepts, but may promote confidence in students that encourages them to tackle what they view as difficult material, especially quantitatively-based subjects. For many of our students, this would be a major step in performing satisfactorily in their classes. Although grading homework does consume resources—faculty grading time—the return on investment (cost of college and opportunity costs) to continue to remain until graduation. Implementing a system of graded homework with a strong emphasis by the instructor may aid in this endeavor.

CONCLUSION

The results of this study are consistent with Galyon, Blondin, Forbes, and Williams (2013) findings that graded homework was a significant predictor of grades. As students continue to enter college under-prepared in quantitatively-based skills and standards must be maintained to advance toward graduation, experimentation with the impact of graded homework on final grades provides a viable option for improvement of final course grades. This state of a lack of math proficiency with our current students relates closely with students struggling with math disabilities. (Zhang, et al., 2012). If chunking, as the result of repetitive homework, has a positive effect on students who have developed a disdain for or anxiety of math, can efficiently overcome these conflicts, the solution may be relatively simple. As was indicated from the ETS report (Goodman, Sands, & Colley, 2015), it is imperative that American regain its educational strength for continued success professionally and personally for individuals and as a collective.

FUTURE RESEARCH

As Lehtner, (2008) expressed in her study, college students must have confidence to fully understand concepts of algebra. Certainly, the role of graded homework in developing confidence in students needs to be further explored. This is especially true in quantitatively-based courses. Math anxiety is real and destructive for student learning and by the time they arrive at college it has become difficult to address. A document from the Math Center at Texas A&M (n.d) states: “Math anxiety has become so prevalent on college campus that many schools have designed special counseling programs to help math anxious students.” (para. 2). Any pedagogical technique that can improve their confidence will positively impact their journey to graduation. Studying the impact of completing graded homework for specific groups needs to be considered. As more and more of students with ‘special needs’ and inadequate math skills (Goodman, Sands, & Colley, 2015) enter in our classes, there is an obligation to them to find ways to advance their learning. Students must have a positive return on their investment (cost of college and opportunity costs) to continue to remain until graduation. Implementing a system of graded homework with a strong emphasis by the instructor may aid in this endeavor.

REFERENCES


