Examining the Impact of Frequent Quizzes on The Mastery of Foundation Design Concepts

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Abstract

During 2020-2021, a study was carried out in all sections of the Foundation Design course at The Citadel. The objective was to determine if frequent quizzes increase students' performance on the midterm and final exams compared to those students who did not have frequent quizzes. The preliminary results of this Work-In-Progress study suggests that there may be a link between weekly quizzes and students' performance on the exams.

Keywords

Quizzes

Introduction

A study by the Department of Education found that having students take a quiz is almost always a more powerful learning tool than having students spend additional time studying the target material[1]. Another study utilized a quiz-a-day strategy in four sections of undergraduate psychology courses. Students were given two short essay questions each day, and then afterward, the class discussed and reviewed the correct answers. Comparing the final exam grades, this study found that students exposed to a quiz-a-day had on average of an eight percent higher grade[2]. Investigators at the U.S. Military Academy[3] eliminated the graded homework and replaced them with weekly quizzes in three electrical engineering courses. Based on the student performance, the authors suggest replacing homework altogether with in-class quizzes. In another study[4], investigators showed that switching from traditional homework to weekly quizzes, increased grades, time spent on homework, and students' perception of learning. Similarly, a multi-course study[5] explored relationships between individual student grades in homework, quizzes, tests, and final exams in four different undergraduate courses. Their data indicates a very weak correlation between homework and midterm scores when compared to a much stronger correlation between quizzes and exams. In fact, the use of quizzes has been established as an effective tool for assessment and encouragement of self-directed learning.

Course Description and Methodology

As a requirement for graduation, Civil Engineering majors at The Citadel must take Geotechnical Engineering II (Foundation Design) in the second semester of their senior year. This course focuses on the analysis and design of foundations. The Foundation Design is a three-credit hour course. It is offered in the spring semester during the student's senior year. One section of the course is typically offered in the day program and one section is offered in the evening program. In 2021, the instructor of the Foundation Design course employed weekly quizzes to encourage students to keep up with course material and to provide frequent feedback. The quizzes were

based on the content of the design project and pre-class reading assignments. The quizzes typically took 15-20 minutes to complete. Immediately after each quiz, students received feedback about their scores. The investigation was carried out in both the day and the evening sections of the Foundation Design course. Student mastery of the course learning objectives was measured directly using midterm and final exam questions. Indirect assessment data were also collected and consisted of a self-perception survey at the end of the course in the sections with weekly quizzes. Students were asked two questions:

Question #1. I feel weekly quizzes help me figure out if I understand the course material.
Strongly Agree Agree Neutral Disagree Strongly Disagree

Question #2. Weekly quizzes _____.

(a) increase the amount of time spent on Foundation Design.
(b) decrease the amount of time spent on Foundation Design.
(c) has no effect on the amount of time.

Assessment of Learning and Perceptions

The 2020 cohort was offered both in -person and virtual and 2021cohort was offered only in-person. Direct assessment data consisted of student performance on three midterm exams and a final exam. Results were compared to the previous year, which did not include weekly quizzes. Figure 1 shows that the students in the weekly quiz sections outperformed the students in sections without weekly quizzes by five to seven percent. The overall exam average was improved by the weekly quizzes approach (88.4%) when compared with the no quiz approach (81.1%). The results in Figure 1 may suggest a link between frequent quizzing and students' performance on midterm and final exams.

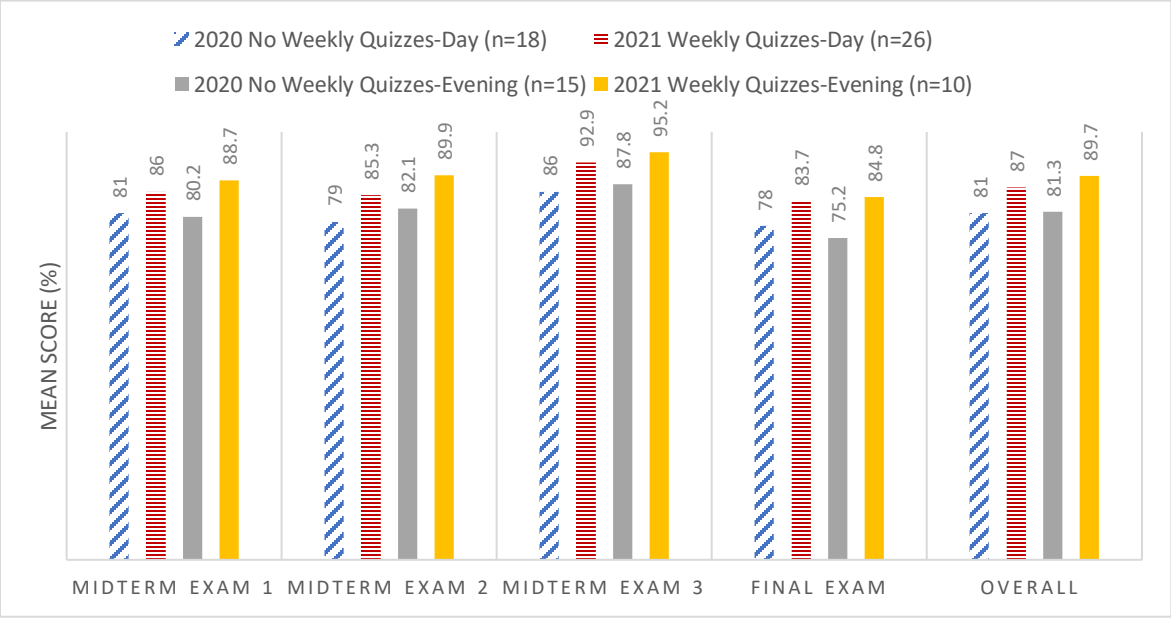

Figure1. Comparison of midterm and final averages for sections of Day and Evening programs.

Indirect assessment results are shown in Figures 2 and 3. Figure 2 shows that 92% of students agreed that the quizzes were beneficial in determining if they could successfully accomplish a certain objective. Figure 3 illustrates that 83% of students stated that frequent quizzes increased the amount of time spent on Foundation Design. Survey data shows that most students perceived those frequent quizzes helped them determine what they understand and what they need to review. Additionally, frequent quizzes were helpful because they provided the student with frequent and timely feedback.

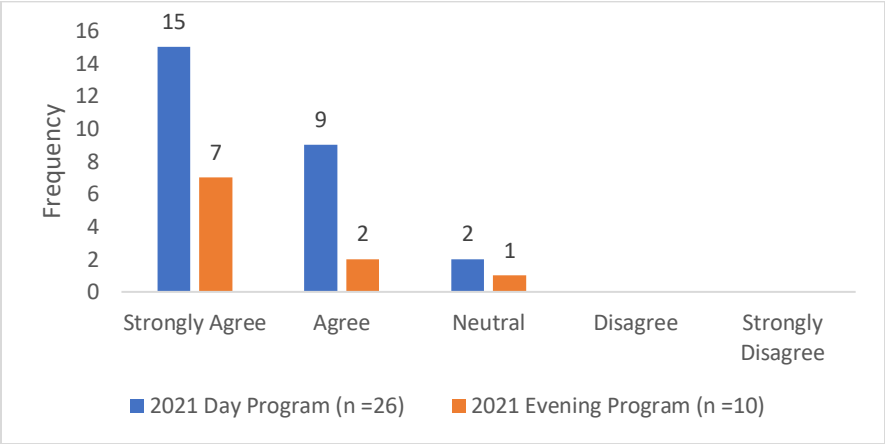

Figure 2. I feel weekly quizzes help me figure out if I understand the course material.

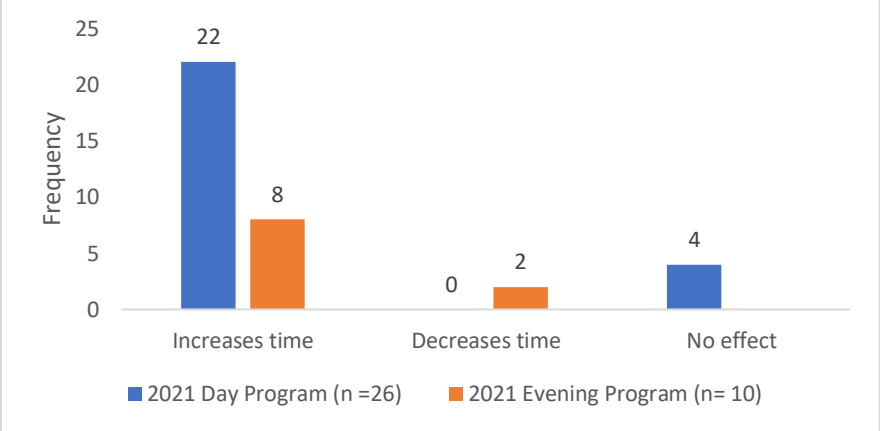

Figure 3. Effect of daily quizzes on study-time.

Conclusion

Students in the sections with weekly quizzes outperformed the students in the sections without weekly quizzes by five to seven percent. Most of the students agreed that the quizzes were beneficial in determining if they could successfully accomplish a certain objective. Eighty-three percent of students stated that frequent quizzes increased the amount of time spent on Foundation Design. It is important to note that the results of this Work-In-Progress study are limited to the two years assessed and should not be generalized to draw broader conclusions. Further data collection and analysis is warranted over the next few offerings before conclusions can be made.

References

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