Learning Reinforcements and Incentives: 
Offering Points and Getting Results

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This paper was completed and submitted in partial fulfillment of the Master Teacher Program, a 2-year faculty professional development program conducted by the Center for Faculty Excellence, United States Military Academy, West Point, NY, 2013

Abstract

For this study two primary things occurred: four sections (I, J, K, and L hours), of the eight sections a particular course was taught were offered an incentive –which could also be viewed as a learning reinforcement method– and administered periodic quizzes. The quizzes were structured much like the multiple choice questions on the exams and the offered incentive / secondary reinforcement was that cadets in the applicable course hours were offered the opportunity to resubmit graded labs and earn up to half of the points lost based upon their submitted corrections. Both the offered quizzes and the re-submission of graded labs was welcomed by the cadets and when surveyed the vast majority of cadets felt that the quizzes helped prepare them better for multiple choice and concept questions while being able to resubmit labs reinforced their learning and aided in their understanding of concepts of the course.

Introduction and Methods

There are numerous methods and topics discussing the reinforcing of learning in today’s classrooms at all levels of education. I think it is safe to assume that in most cases a student seeking graduate and post-graduate education has an idea of what is important in their particular field of interest. Therefore, reinforcing students’ learning is probably more applicable at the undergraduate-level of education and the formative years leading up to college. In this research project two methods of reinforcing learning in a third-year, undergraduate-level course were offered. An incentive to the students was also provided combined with one of the reinforcement methods.

The course taught during this study is a core requirement for the Geospatial Information Science major, within the Geography & Environmental Engineering Department, as well as a core elective for other majors within the department. It is also a popular elective for numerous other majors offered at the United States Military Academy. The spring semester of the academic year typically offers eight sections of this course and the sections are filled primarily with majors within the department.

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like the multiple choice questions on the exams which focus on key terms and the student performance objectives from each lecture as well as learning concept questions from graded labs.

The offered incentive/second reinforcement method was that cadets in the applicable section hours were offered the opportunity to resubmit graded labs and earn up to half of the points lost based upon their submitted corrections.

Much research has been done on the offering of incentives to improve test scores. Recently in the University of Chicago used monetary and symbolic rewards for students that performed well on standardized exams in Mathematics and English\(^1\). This research demonstrated that students viewed symbolic rewards (trophies) over that of monetary awards (in the amounts of $20 and $10) and performed better if offered a trophy instead of money. Here at The United States Military Academy final grades in courses are based on the amount of accumulated points of a finite total (typically 1,000 or 2,000 points). There is no arguing that many cadets’ eyes are on the points that they have earned and, at least in the courses that I have taught, effort is distributed based on the amount of points a graded event is worth.

The incentive offered in this research involved providing cadets to option of submitting corrections to incorrect answers on graded labs. The instructor’s intent behind the incentive was to reinforce learning for, particularly, cadets within the major as they would cover similar material—though not in as much depth—in the advanced level course that they would be required to take in a future semester; however, the incentive was offered with the knowledge that the ability to garner a portion of the missed points back, thus improving their final grade, would be appealing to cadets.

In July of 2012 Steve Trost and Djavad Salehi-Ishfahani conducted research on the completion of online homework and the correlation to exams\(^2\). In this research the authors separated students randomly into two groups. One group was required to complete online homework assignments while it was optional for the other group. The group required to complete the online homework outperformed the group in which the onus to complete the online homework was on them.

A similar method was utilized in this research. Two instructors taught the course in questions; having four sections of students each. All eight sections varied in size, between 14 and 17 students in each section, due to the various scheduling requirements for each cadet’s situation and major. Four of the eight sections were taught by the author of this research (I, J, K, and L hours) and these courses were provided periodic quizzes (seven throughout the semester) of ten points each. These quizzes made up 70 of the 100 points for instructor grade (out of a possible 1,000 points for the course). These quizzes were offered simply as a tool for guiding the cadets’ preparation for the multiple choice portion of the exams as well as provide a quantitative foundation for the instructor grade portion of the final grade.


Results

With regards to quizzes results appeared to be mixed with one section from the sections provided quizzes losing slightly more points on the multiple choice portion the exams than one of the four sections not administered quizzes (Figure 1). This same phenomenon occurred with each exam, with at least one section losing the same or slightly more points on the multiple choice portion of the exam than a section that was not administered quizzes.

Figure 1 This histogram showing points lost on the multiple choice and concept portions of the three exams administered during the semester. The area within the red outline is the four sections that were administered quizzes as well as offered the opportunity to correct lab errors and resubmit for an improved grade.

Following the first exam I surveyed my cadets and asked two questions: 1) Did one of my cadets know a cadet in one of the sections not administered quizzes, and 2) Did one of my cadets study with, or provide a copy of the quiz(zes) to a cadet from a section that was not administered quizzes. 53 of 61 of cadets (87%) in the sections receiving quizzes answered that they did know at least one cadet in a section that did not receive quizzes. Of those 53 cadets 47 (88%) answered that they either studied with a cadet from a non-quiz section or provided one or more cadets a copy of the quiz for them to study. It was this sharing of resources while preparing for the exams that may account for the mixed results in points lost on multiple choice questions.

The combined reinforcement method/learning incentive of providing cadets the option to correct mistakes on graded labs and resubmit for up to half of the points lost was very warmly received by the cadets in my sections. Figure 1 displays the results of points lost on the concept portion of the exams, which is where the labs most closely ascribe. Again, the results are mixed;
more so than that of the impact of quizzes on the multiple choice portion of the exams. There are many factors that could distribution of lost points here such as individual cadet anxiety during exams, lack of preparation, etc. The difference between sections being offered the option of re-submitting a lab for an improved grade does not appear significant different than that of the sections not given that option.

With regards to overall exam grade the results of the quizzes and re-graded labs is not significantly present. Figure 2 shows that at least three of the four sections provided quizzes and the option of submitting lab corrections performed slightly better than at least three of the sections not provided those reinforcements/incentives to learning the material. The sharing of the quizzes while preparing for the exams may account for some of the lack of separation. This will be discussed in the conclusions and future research section below.

Figure 2  This histogram shows the overall grade distribution between all eight sections of the course.

The portion of this research that strikes me the most is the end of course survey results. Five additional questions were asked to the cadets in the sections that were administered quizzes and provided the option of submitting lab corrections (Figure 3).
It is clear that the vast majority of cadets felt that the quizzes helped them in preparing for the multiple choice portion of the exams. On multiple occasions I was asked by my cadets when another quiz would be given. On a couple occasions I was actually asked by a few cadets from one of the four sections not given the reinforcement/incentives when I would provide another quiz. Of importance, in my opinion, are questions D4 and D5. Anyone can study and remember key terms and, perhaps, even multiple choice quiz questions. However, without study one cannot hope to comprehend or even master the fundamental theories and software usage of this particular course (which is the clear software choice for professionals in the civilian sector). As evident from the survey the vast majority of cadets felt that their understanding of the course material and software was improved due to the option of submitting lab corrections.

**Conclusions and Future Research**

Methods to reinforce learning in students should be utilized whenever practical. As undergraduates many students are selecting majors based on their interests. This does not necessarily mean that they know or comprehend the theoretical background of the major; which is where we as educators come in. In order to effectively convey what is important in their major of choice and the courses ascribed to their major teachers/instructors/professors should use any number of methods to provide an incentive for learning as well as reinforce that learning. In some instances the method of incentivizing and reinforcement can be accomplished in the same instance.
This research used a reinforcement method in the form of quizzes administered to four of eight sections taking the course. Additionally the option was made available to the same cadets to submit corrected lab questions and gain back up to half of the points lost. This method was utilized as both an incentive and a reinforcement method. Results were mixed with regards to both the lab resubmissions and quizzes; however, it became evident that quizzes were shared with cadets in sections not originally administered quizzes when preparing for exams. Ultimately the most promising result was the perceived impact of the option of submitting corrected labs. The vast majority of cadets felt that the lab corrections reinforced their understanding of critical course components; particularly cadets within the Geospatial information Science major. To improve on the methods of this research perhaps quizzes could be administered again to half (or one third) of the sections taking the course. Then the cadets receiving the quizzes could be asked to not share the quizzes with their classmates/peers in the sections not receiving quizzes.

Works Cited
