BONUS AS AN INCENTIVE

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Abstract

The study followed students after providing a bonus incentive related to mastery status of online homework. The 215 students were separated by achievement of mastery status and then placed in a category based upon the timing of when the onus incentive was given during the semester: as early, late, or not incentivized. The relationships between incentive timing and mastery were analyzed as well as the mastery status' effect on final exam scores.

Literature Review

Following the seminal study by Harlow, Harlow, and Meyer (1950), there have been a plethora of studies on the effects of external rewards on internal motivation (Akin-Little, Eckert, Lovett, & Little, 2004; Leper, 1983, Rummell & Fielding, 1988). Many of these studies highlight the negative effects. In contrast, other researchers have found that external motivation does not necessarily undermine intrinsic motivation (Pittman, Boggiano, & Ruble, 1983; Vasteenkiste, Lens, & Deci, 2006). Some have even found that external rewards can be effective tools for enhancing learners' motivation for learning (Akin-Little, Eckert, Lovett, & Little, 2004; Cameron & Pierce, 1994; Rassouli, 2012). Most specific to the college classroom and context of this study, further research has shown that when motivation is increased, class participation and persistence over the short-term are higher than those with a new goal condition (Jung, Leung, & Miller, 2016; Miller & Mallott, 1997; Vasteenkiste et al., 2004).

Methodology

This study of 215 students from a small private university in the Midwest was in ex post facto, quantitatively focused observational design. The data was collected across three years and included students from Pre-Calculus (n = 24) and Statistics (n = 191). During the three-year study, students were provided an opportunity to achieve mastery in the Pearson Mystatlab online homework system which was used to provide course points, accounting for approximately 20% of each student's semester course grade. The students from the first year (n = 84) who used the Pearson system were not given any incentive to complete the online homework assignments and achieve mastery status. In year two, there were 74 students who were allotted five potential bonus points in the class for achieving mastery

status on the online homework; their incentive was provided during the last two weeks of the semester. In year three, the students were told on day one of the course of the opportunity to gain 5 bonus points in the class at the end of the semester as a reward for maintaining a 100% average on all homework assignments. These 60 students were reminded frequently of this potential reward. Despite the initial conditions of mastery homework status, the bulk of this study was on the effect of the mastery status on the final exam score. The sole component of assessment was the final exam score of each student. Therefore, the statistical framework of analysis was based upon the following research questions:

Q1: Is there a relationship between when the incentive of 5 bonus points was provided (i.e. early, late, no incentive) and whether the students completed the 100% mastery standard?

Q2. Is there a difference in the mean final exam scores for those who were given the incentive and earned mastery compared to those who were incentivized but did not earn mastery?

Q3: Is there a difference in the mean final exam score for those who achieve the mastery standard when grouped by the time of the incentive?

Results

The combined results of the three years of data when grouped by timing of the incentive show distinctive results. Over the course of the three years, 66 earned the 100% mastery status on the online homework, leaving 149 that did not opt to earn the bonus incentive. When disaggregated by incentive timing, the students who had no incentive and did not achieve mastery averaged a final exam score of 80.32 with a standard deviation of 16.993. The sample size was 79. Also part of the no-incentive group, there were five students who achieved mastery with a final exam average of 96.20 and standard deviation of 3.701. For the late incentive group who were given the opportunity in the last two weeks of the course to earn the five bonus points with achievement of mastery status, there were 71 total students. Of the 35 non-mastery students, the average was 82.80 and a standard deviation of 16.469. Adding to that late-incentive group, the 36 mastery students averaged 88.03 and a standard deviation of 11.005. The latest group was allowed an early incentive, starting on day one in the hopes of motivating them to achieve mastery status of 100% on the online homework across all sections of the text. The final exam scores were 74.63 with a standard deviation of 14.061 for the 35 non-mastery students while the mastery students of the same incentive-timing group had an average of 85.64 with a standard deviation of 10.808 for its 25 students.

Figure 1

Incentive timing	Status	Mean	Std. Deviation	Sample size
Early incentive	Non-mastery	74.63	14.061	35
	Mastery	85.64	10.808	25
	Total	79.22	13.836	60
Late incentive	Non-mastery	82.80	16.469	35
	Mastery	88.03	11.005	36
	Total	85.45	14.115	71
No incentive	Non-mastery	80.32	16.993	79
	Mastery	96.20	3.701	5
	Total	81.26	16.921	84

The specific results of research question one addressed the relationship between when earning mastery and when the incentive was offered. The sample proportional breakdowns of mastery status by timing category were 6% (5/84) for the no-incentive, 51% (36/71) for the late incentive, and 42% (25/60) for the early incentive. Both the early and late incentivized groups had much greater mastery participation than those who were not offered the reward. A chi-square test for independence showed a relationship between mastery status achievement and incentive timing with a value of 40.93, $p < .0001$ with two degrees of freedom. The Cramer's V test was also statistically significant with a p-value less than .0001, demonstrating a medium effect size for generalization.

The results of research question two explored the comparison of the mean exam scores for the incentivized mastery and non-mastery groups. The sample means for the final exams or 87.0 for the mastery group and 78.7 for the non-mastery group. A one-tailed independent t test assuming unequal variances with 61 observations in the mastery group and 70 observations for the non-mastery group showed a $t(213) = 3.55$, $p < .0001$. The Cohen's D value was .614. The results were both statistically significant.

The one-way Anova demonstrated the results of the third research question which was to examine the mean final exam scores for those students who achieved the mastery standard when grouped by the time of incentive. A value of $F(2, 65) = 2.09$, $p = .132$. The mastery/early incentive group ($n = 25$) earned a mean score of 85.64. The mastery/late incentive group ($n = 36$) final score mean equals 88.03. The mastery/no incentive group ($n = 5$) result for the final exam averaged 96.2. This result was not able to be inferred to the population.

Additionally, there were other aspects of this study outside the scope of this presentation whose results were intriguing. For instance, the data also lent itself to testing the homework grades by Incentive/not status: $t(213) = 2.79$, $p<.01$, by time of incentive: $F(2, 212) = 5.010$, $p<.01$, and by mastery/not status: $t(213) = 9.99$, $p<.0001$. When the exam grades were deeply analyzed, the following results were determined: when grouped by incentive/not status: $t(213) = .60$, $p = .28$, by time of incentive: $F(2,212) = 2.93$, $p = .06$, and by mastery/not status: $t(213) = 4.33$, $p<.0001$. Finally relationships of homework and exams were also considered. Here, the correlation of homework to exams scores was $r = .290$, $p<.001$ but when subdivided to only include students with mastery status, the results changed to $r = .20$, $p<.001$.

Conclusions and Discussion

My overall conclusion from the study was that early incentives produced a greater interest in achieving mastery in the online homework. In short, external motivation was increased by allowing for a 5 point bonus incentive. I also found that the incentivized students who achieved mastery had higher statistically significantly higher exam scores than those who were incentivized but did not achieve mastery status on their online homework. Finally, the timing of the incentive when coupled with a mastery level of online homework showed that there was no effect on the final exam scores. This last conclusion indicates that students

who cram to get a high grade and students who structure their workload throughout the semester earned the same general score. Though incentives may motivate students, the timing of the bonus opportunity was irrelevant. Furthermore, all statistically significant results had medium effect sizes which indicates a logical conclusion toward generalizability when provided with same type of population. My results support prior research in that incentives as a reward structure for classroom performance produced greater degrees of adherence to performance standards than behaviors without incentives (Bailey, Rosenthal, & Yoon, 2016; DeVahl, King, & Williamson, 2005; Nonis, Ford, Logan, & Hudson, 1996; Miller & Mallott, 1997; Rassouli, 2012; Rousu et al, 2015; Tudor & Bastow, 1991).

Limitations

The sample was contained to the 215 students who studied under the same professor during the fall and spring semesters from 2014-2017. This sample of students represent only the population of students in private universities whose ACT scores approximate the national average. Furthermore, as the results produced only a medium effect size, the research may be considered less impactful to the general population.

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