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DECREASING PLAGIARISM: WHAT WORKS AND WHAT DOESN'T

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Abstract: We tested the predictions of a game theory model of plagiarism, with a test population of student papers submitted to an online plagiarism detection program over five semesters in a non-majors biology course with multiple sections and high enrollment. Consistent with the model, as probability of detection and the penalty if caught increased, plagiarism rates dropped, although the latter had a smaller effect. The percentage of plagiarized papers decreased from almost 30% to less than 6% between semesters, as more students became aware that our entire course utilizes a plagiarism detection program and penalizes students who are caught plagiarizing.

Plagiarism, a form of cheating in which others' work is presented as one's own, is quite common, with studies finding that between 3% and 98% (mean = 47%) of students plagiarize in writing assignments (Bjorklund and Wenestam 1999, Dawkins 2004, Whitley 1998). There is little disagreement that plagiarism is a bad thing, as well as widespread. Students who cheat don't learn course content or the higher order thinking skills associated with synthesizing the work of others. This is a serious problem in any field in which success in upper-division courses is dependent upon knowledge and skills learned in lower-division classes. Cheaters also contribute to grade inflation if not caught, which penalizes honest students. Widespread cheating leads to the perception of unfairness, particularly if students perceive that faculty seldom catch cheaters or rarely punish them when caught. This can lead others to cheat who might not otherwise do so (Ashworth et al 1997, Mixon 1996). Furthermore, cheaters continue to cheat, which can have dramatic consequences when our students go on to become health professionals, businessmen and women, or even teachers themselves (c.f. in medical school: Baldwin and Daugherty 1996; in business: Sims 1993; in education graduate school: Love & Simmons 1998).

There are many studies addressing what leads students to cheat and many variables have been identified that correlate with cheating (see Whitley 1998 for a review). Whitley (1998) has made the point that we are able to control only some of these variables. For example, male students and students with many extracurricular activities (particularly partying) are more likely to cheat, but we are not going to change the gender or social lives of our students (c.f. McCabe and Trevino 1996, 1997). Similarly, it would be challenging and outside the scope of a biology class to convince students, many of whom use Napster, that stealing intellectual property is ethically

wrong (Barbrook 2002; references for the relationship between ethical beliefs and cheating in Whitley 1998).

There are, however, variables that we can control. Students are more likely to cheat when the benefit to cheating is high, when the costs and penalties to cheating are low, and when the probability of being caught is low (Mixon 1996, Underwood and Szabo 2003, Whitley 1998). The costs of plagiarizing in particular have become much lower in recent years, with so many internet resources just a click and a drag away (Scanlon and Neumann 2002, Underwood and Szabo 2003, 2004). We can alter these costs and benefits, or at least alter students' perception of the costs and benefits of cheating. Furthermore, some cheating appears to be due to students not understanding what is acceptable and what is not. This is a problem more often with plagiarism than other forms of cheating (Ashworth et al 1997). There have been many methods published for helping students understand how to cite and quote correctly, which appear to decrease the incidence of plagiarism (e.g. Culwin 2006, Landau et al 2002, Schuetze 2004, Soto et al 2004, Willmott and Harrison 2003).

These interventions take time, for instructors and for students, both outside of and within the classroom. Because time is limited for all of us, we were interested in the relative effectiveness of these interventions in decreasing plagiarism. We developed a game theory model to consider what, in terms of potential consequences, would be most likely to decrease the probability of a student choosing to plagiarize. We then tested the predictions of the model with student papers submitted to an online plagiarism detection program (Turnitin.com, see McKeever 2006 for a

review of on-line plagiarism detection programs) over five semesters in an introductory non-majors biology class with multiple sections and high enrollment.

Methods

The Model

Cheating and honesty can be viewed as two separate strategies, with cheating students earning one grade and honest students earning another. We can then utilize game theory to see which of these two strategies would prevail under varying conditions (e.g. Maynard Smith 1982). For instance, honest students could on average receive grade $G_{h,}$ and cheating students that did not get caught would receive $G_{h,}$ plus the benefit of cheating C, and students who get caught cheating lose some proportion of their grade, P. In our model, the pay-offs for students playing a particular strategy against another strategy can be seen in Table 1. The average grades for honest and cheating students can be seen below:

1)
$$\overline{X}_h = G_h$$
$$\overline{X}_c = \left[1 - p_d\right]\left[G_c + C\right] + p_d\left[G_c + C - P(G_c + C)\right]$$

where p_d is the probability of being detected. We realize that this is a gross oversimplification of the factors that influence student grades, and that other factors such as time availability may influence students' probability of cheating (see Whitley 1998 for review). However, our main purpose here is to examine how the degree of penalty and the probability of detection influence student cheating. For cheaters and honest students to have the same score, the averages (see Equation 1) must be equal. That means:

2) $G_h = [1 - p_d][G_c + C] + p_d[G_c + C - P(G_c + C)]$.

If we than assume that G_h and G_c are equal and that P=1, we can create a simple inequality by simplifying equation 2, to illustrate when an honest strategy which receives grade G_h will be favored over a strategy that cheats.

3) $G_h \geq C\frac{(1 - p_d)}{p_d}$

If the honest grade (G_h) is greater than the right side of equation 3, then adopting an honest strategy will be favored. The right side of the equation is the benefit of cheating multiplied by the odds of not being caught. Put simply, if students are unlikely to get caught the benefit needed to favor a cheating strategy is smaller (Figure 1). If we wish to vary the penalty P, the inequality is modified as follows:

4) $G_h \geq C\frac{(1 - Pp_d)}{Pp_d}$.

Interestingly, the effect of increasing the penalty up to 10 times the value of the assignment (essentially failing the course after cheating on one assignment) has a relatively minor effect compared to increasing the probability of detection (Figure 2).

Three hypotheses are generated from this simple model. First, changes in the probability of detection (or perceived probability of detection) will influence the amount of plagiarism/cheating (Figure 1). Secondly, as penalties increase the amount of plagiarism/cheating should decrease (Figure 2). Lastly, changes in probability of detection should have much greater effect than changes in the penalty for cheating.

Testing the Model

Biology 101, a non-majors introductory biology course at California State University Fullerton, enrolls approximately 1,400 students each semester, in 14 to 15 sections averaging 100 students per section. All students in Biology 101 complete two writing assignments as part of the course requirement. These writing assignments are written annually and graded by graduate students using a common rubric. Graders participate in training/grade-norming sessions, so that grading is standardized across sections.

In each assignment, students are given a prompt that requires them to write about science, synthesizing information available to them in their textbook and associated readings, written in the format of a letter to a family member or politician. For example, students write a letter to their aunt, whose son has been diagnosed with leukemia, describing the basic biology of cancer and describing how different treatments affect the growth of cancerous cells. Both the first and second assignment use the same format and are of the same length (750 to 1000 words), and the requirements for documenting sources are identical between assignments. You may email the senior author for examples of these assignments and associated rubrics.

These assignments must be submitted to Turnitin.com, and the assignment instructions state that papers with over 10% shared content will be evaluated for plagiarism. We chose 10% as the cut-off because in our experience, shared content below 10% tends to be due to short sentence fragments that did not necessarily constitute true plagiarism, whereas shared content above 10% is most often due to whole sentences or paragraphs being taken from other sources. Students are not allowed to quote sources in their papers; it is uncommon to quote within scientific papers, and we have found that students lean too heavily on quotations when allowed to use them.

Most instructors state in their syllabi that papers identified as plagiarized will receive a zero for the assignment, and the student will be turned in to the Dean of Students for academic dishonesty. Second offenses will result in a failing grade in the course. Instructors vary in the time that they spend reviewing these guidelines with students, but all discuss them in class to some extent.

We tested the predictions of our model using 10,993 student papers submitted for course credit in Biology 101 (Spring 2004: 1,265; Fall 2004: 2,500; Spring 2005: 2,360; Fall 2005: 2,613; Spring 2006: 2,255). These papers were evaluated for shared content with web resources and other student papers (Turnitin.com's "Originality Report"). In the first semester (Spring 2004), student submissions to Turnitin.com were not separated by session, but in all following semesters they were, for a total of 56 sessions over four semesters.

Results

The main predictions of the model are 1) that plagiarism rates should decrease as the probability of detection increases, 2) that plagiarism rates should decrease as the penalty for plagiarizing if caught increases, and 3) that plagiarism rates will decrease more dramatically by increasing the probability of detection than by increasing the penalty if caught.

We looked at plagiarism rates in two ways. First, the average "shared content" score was calculated for all papers submitted in each class. On average, student papers shared 4.2 $\pm$ 8.2 (S.D.) % of content with outside sources and other student papers (N=10,993 papers). Second, since the cut-off score for allowable shared content was 10%, we calculated a "percentage plagiarized" score, defined as the percentage of papers that exceeded this cut-off in each class. Out of 10,993 papers, 1,350 were considered plagiarized, as more than 10% of the content was shared with outside sources (12 $\pm$ 0.3 (S.D.) %). We used multiple measures to estimate the probability of detection and the penalty for plagiarizing if caught.

Prediction 1: Plagiarism decreases with an increased probability of detection Students cannot know the exact likelihood of plagiarism being detected, but their perception of this likelihood can change. We predicted that levels of plagiarism would drop over time, as students became aware that a plagiarism detection program was being used in Biology 101 and that students who plagiarized would receive penalties. This prediction was met; the average "shared content" score dropped from 8.3 $\pm$ 0.2 (S.E.) % in Spring 2004 to 2.5 + 0.2 (S.E.) % in the Spring 2006 (Figure 3a, $F_{(1,10,998)}$=163.7, P=0.001). The percentage of papers plagiarized (>10% shared content) also dropped each semester, from 31% in the first semester using Turnitin.com, to 6.3% four semesters later (Figure 3b, x^2=509.07, P<0.0001).

We predicted that students who were able to see the "shared content" score for their papers would be less likely to plagiarize. Turnitin.com offers the option of allowing students to see this score in the "Originality Report" prepared for each submission. During Spring 2004, no students were able to see their Originality Report. In following semesters, most sections allowed students to see their Originality Report, while some did not. Students can revise and resubmit their paper, which we predict they would be more likely to do if they can see their shared content score. Because sections were assigned different treatments (e.g see score or not see score), we treated sections' averages or total counts as replicates in this analysis. In addition, we excluded spring of 2004 because no section could see its originality report. As predicted, average shared content was significantly lower when students were able to see their score (Figure 4a, $F_{(2,52)}$=12.035, P<0.0001). In addition, there was a significant drop in the percentage of students plagiarizing (>10% shared content, Figure 4b, x^2= 89.3, P<0.0001).

Another possibility is that students in larger sections might feel that they are less likely to be caught plagiarizing. We did not find lower average shared content in smaller classes (Class size by average "shared content" score: r=-0.1649, p=.23; Class size by % students plagiarizing (>10% shared content): r=-0.1886, p=0.1680; Spring 2004 excluded as submissions were not separated by section, N=55 sections).

Prediction 2: Plagiarism decreases as the penalty for plagiarizing increases We predicted that sections in which writing assignments are worth more, and hence the cost to being caught is higher (since a zero on the assignment will have a larger impact on the final course grade), will

have lower rates of plagiarism. Across sections, writing assignments were worth from 10 to 30% of the final grade in the course. Students in sections in which writing assignments were worth more plagiarized at a significantly lower rate, as we predicted (Figure 5a & b, % grade determined by writing assignments by average "shared content" score: r=-0.3280, p=.01; % grade determined by writing assignments by % students plagiarizing (>10% shared content): r=-0.2734, p=.04; Spring 2004 excluded as submissions were not separated by section).

In a few sections, the second assignment was worth more than the first assignment, so we predicted lower rates of plagiarism on the second assignment. This effect would be compounded by students having a clearer understanding of the probability of being caught plagiarizing after having seen the "Originality Report" for their first paper submission to Turnitin.com. This prediction was not supported; in fact students were more likely to plagiarize on their second paper (11% of students plagiarizing (>10% shared content)) than on their first (8.2% of students plagiarizing, x^2=18.5, P<0.0001). The average "shared content" score was also significantly higher on the second paper (4.0 $\pm$ 0.3 (S.E.) %) than on the first paper (3.3 $\pm$ 0.3 (S.E.) %) (paired t-test: t=3.33, p=.0016, df=52).

Prediction 3: Plagiarism decreases more in response to increasing the probability of detection than to increasing the penalty for plagiarizing An estimate of the effect size of each variable can be compared by looking at the proportion of variance in shared content that is explained by each. In an analysis of variance on the effect of having students view their originality report (increasing their perception of the probability of detection), approximately 32% of the variance can be explained (r-squared = .3164). In comparison, an analysis of variance on

the effect of the value of the assignment (higher value increasing the potential penalty for plagiarism), only 11% of the variance can be explained (r-squared=.1075). In other words, increasing the probability of detection has three times the effect of increasing the penalty for plagiarism, using our best indicators of these variables.

Do students plagiarize because they don't know what plagiarism is? In some sections, students participated in a class activity on plagiarism that included showing a Turnitin.com report for a plagiarized paper, a reading activity and clicker quiz illustrating kinds of plagiarism, and a class discussion. Students in these sections were also allowed to view their Originality Report when they submitted their assignments to Turnitin.com. Although these sections had lower plagiarism rates than all other sections in the same semester, the average "shared content" score and percentage of papers plagiarized ((>10% shared content) were not significantly lower than sections in which students were allowed to see their Turnitin.com "Originality Report" but did not participate in the class activity (Figure 4a & b).

Discussion

We were able to significantly reduce plagiarism in Biology 101 (from 28.5% to 5.6% of submissions in five semesters) by instituting a policy that 1) all writing assignments will be submitted to an online plagiarism detection program, and 2) students who plagiarize will be penalized. Students' perception of the probability of being caught plagiarizing appears to have increased over time; some of the ways that students may have become aware of this include discussion among friends, comments on RateMyProfessor.com (an online website where students rate and comment on their professors), and through extracurricular contacts (e.g.

athletics and fraternities/sororities). Martin (2005) also found a decrease in plagiarism across semesters when students were required to submit papers to Turnitin. This result supported the prediction of the model that students would be most responsive to changes in the probability of being caught when deciding whether or not to plagiarize.

Within semesters, several variables appear to have an effect on the likelihood of students plagiarizing. The strongest predictor of plagiarism rates within a semester was whether or not students were able to view their Originality Report on Turnitin.com, which calculates a "shared content" score, and revise and re-submit their paper if the score was higher than 10% (our cut-off for plagiarism). This again supports the model's prediction of decreased plagiarism with an increasing probability, or perception of the probability, of being caught. For the last two semesters, all sections of Biology 101 have allowed students to view their Originality Reports, as we saw the strong inhibitory effect it had on plagiarism.

We also predicted that students in larger classes would feel that they had less chance of being caught plagiarizing because of the relative anonymity in such classes (although this perception is incorrect, since a plagiarism detection program was being used). Class size did not have an effect on the rate of plagiarism in our study. This may be because most sections are around 100 students, with only a few as low as 30 or as high as 150 students; at least one study has found a mild effect of class size on rates of plagiarism (Houston 1986).

Although students in all sections had the same writing assignments, instructors varied in the amount of course credit they assigned to them. The value of both writing assignments varied

from 10% to 30% of the final grade in the course. This allowed us to test the model's prediction that students would be more likely to plagiarize when the penalty for plagiarizing is lower (i.e. the assignment is worth less, and thus a zero on it would have less impact on the final grade). Sections in which the writing assignment was worth more had lower plagiarism rates, although this effect was weaker than the effect of increasing the probability of being caught, as the model predicts. Interestingly, other studies have found a weak relationship in the opposite direction: plagiarism rates increased as the value of assignments increased (references in Whitley 1998).

We also predicted that second assignments would have lower rates of plagiarism, both because of a higher penalty for being caught (as second assignments in some sections were worth more than the first), and because of a higher perception of the probability of being caught (since they had seen the "shared content" score for their first paper). Instead there were significantly higher rates of plagiarism on the second paper than the first. We hypothesize that this is due to students having more time conflicts later in the semester, thus increasing the value to them of plagiarizing, as a plagiarized paper can be written more quickly than a carefully cited one. This increased benefit to plagiarizing appears to outweigh the costs associated with being caught. It is also possible that, because students are not made aware of classmates being caught for plagiarizing, they may have believed that none had been caught, or at least had not been penalized. Several studies have found that students believe that faculty are unlikely to catch cheaters and seldom penalize them even if they are caught (Ashworth et al 1997, McCabe & Trevino 1996, Mixon 1996, but see Bennett 2005). This belief is borne out by research suggesting that disincentives for faculty to catch and punish cheaters (e.g. difficult burden of proof, time taken from research and teaching, the university judicial system, possible lawsuits,

even threats from students) are so high that many faculty do not confront cheaters or, if they do, do not report them to the university (Alschuler & Blimling 1995, Murray 1996, Park 2004).

We were disappointed that neither in-class activities nor homework designed to increase students' understanding of plagiarism had a significant additional effect on the rate of plagiarism if students also see their originality reports. One possibility is that students are in general well aware of what constitutes plagiarism, so the activities did not teach them anything new (but see Overbey & Guiling 1999 and Flint et al 2006, who suggest that neither students nor faculty are clear on what does and does not constitute plagiarism). The literature is full of plagiarism activities, quizzes and homework, but these are usually not tested for effectiveness (c.f. Culwin 2006, Walden and Peacock 2006, Willmott and Harrison 2003). Soto et al (2004) found that students who experienced classroom activities on plagiarism wrote papers with significantly less plagiarized content. However, this study did not afford students the opportunity to see a calculation of the amount they plagiarized and re-submit their paper with changes. In our study, students who were able to do the latter, even though they did not receive any training or class activities on plagiarism, did not have higher plagiarism rates than students who had both opportunities. Given that there is never enough time to teach all of the biology we would like to, any activity that takes up time in or out of class must be shown to be highly effective. At this point, we suggest that a more time-effective approach to decreasing plagiarism may be to briefly review in class what plagiarism is, and university and course policies on plagiarism, then allow students to view their "shared content" scores and revise and re-submit assignments if necessary.

Many authors have recommended developing writing assignments so that they are more difficult to plagiarize (c.f. Sterngold 2004, Walden & Peacock 2006). We used these suggestions to develop writing assignments that require students to combine readings from the popular science literature (Scientific American), their textbook, class activities and personal life experiences, and to come to conclusions and make recommendations based on their knowledge. Assignments of this nature have been in place since the beginning of our study, so we are unable to see if they decrease plagiarism in our case. Certainly the very few papers that students had taken from paper mills stood out quite clearly from the others, and would be more difficult to spot with a traditional assignment.

Woessner (2004) argues that instructors have a responsibility to increase the penalty for plagiarizing so that students perceive that it is not worth the risk to plagiarize. He uses an optimality model to show that as penalties increase, plagiarism will decrease. Like Woessner, we feel that students are making rational choices based on their perception of the costs and benefits of plagiarizing and the probability that they will be caught. However, Woessner's model holds the probability of detection constant and at a somewhat low level. We feel that our model, in which both the probability of detection and the penalty for detection can vary independently, makes more accurate predictions about how students should behave under these conditions. From this, we would argue that increasing penalties for cheating will have less effect on students' propensity to cheat (in our study, 1/3 the effect size) than increasing the probability of being caught. To use an extreme example, people in ancient China who cheated when taking the civil service exams were put to death, and yet people continued to try to cheat on these exams (Brickman 1961; cited in Whitley 1998). The advantages of doing well on these exams – a

stable, well-paying, prestigious job – outweighed some exam takers' assessment of the risk and penalty for being caught cheating. In a more recent study, Bunn et al (1992) found that a higher penalty did not correlate with decreased probability of cheating, and suggests that this is because students did not believe they were likely to be caught. They also point out that, for students who are already failing, receiving an F if caught may not be much of a deterrent.

We believe that the majority of students will not plagiarize if they are shown explicitly what and what is not plagiarism. Although almost 30% of our students had significant plagiarized content in the first semester of this study, over 70% did not. After several semesters of clearly and fairly monitoring and penalizing cases of plagiarism, less than 6% of our students submit plagiarized papers, a drop of almost a quarter of the students enrolled in Biology 101. We do not expect that plagiarism will disappear completely from our classes; the students who continue to plagiarize must either completely misunderstand what plagiarism is, or (more likely, given all the information they are given) they simply assess their probability of being caught and the associated costs incorrectly. These could be students who have cheated in the past, and have either successfully avoided being caught, or when caught have been let off with only a warning**.** Underwood and Szabo (2003) found that 6% of students in their study felt that plagiarism was always acceptable, with about 30% feeling that plagiarism was acceptable under some circumstances. These numbers are very similar to ours, although because of their study design, they did not have an operational definition of plagiarism to compare with ours, which is set at 10% shared content. These similarities suggest that in our first semester using Turnitin, many of the students who felt that plagiarism was sometimes acceptable chose to do so in Biology 101,

and in the final semester reported here only the "hard core" students who always find plagiarism acceptable continued to plagiarize in our course.

What we have done is change the conditions in Biology 101 so that a quarter of our students, who might otherwise have plagiarized, do not do so. These 1-in-4 students are making rational decisions that balance the potential penalty for being caught cheating with the time saved by appropriating others' work. Their assessment of the rational choice in the first semester was to plagiarize, this semester it is to not plagiarize. Today, over 94% of our students submit only their own work in Biology 101. This seems to us to be a significant contribution to the learning that occurs in our non-majors' classes.

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Figures and Tables

Table 1: Payoffs for students adopting different strategies (e.g. honest or plagiarize/cheat). G_h is the grade for honest students. G_c is the grade for cheating students and C is the benefit from cheating. P is the proportion of the grade for an assignment that a cheater is penalized if caught. For example, if P=1 then students caught cheating would receive a 0 on the assignment.

Fig 1: Relationship between probability of detection and the honest score (G_h) required to win over a cheating strategy at different levels of benefit for cheating (C). Different levels of benefit for cheating are indicated by different symbols as well as line types. The area above a particular line is where an honest strategy is favored and the area below a line where a cheating strategy is favored. Note that the honest strategy is favored increasingly and steeply as the probability of detection increases.

Fig 2: Relationship between Penalty P and the honest score (Gh) required to win over a cheating strategy at different levels of detection, P_d. Different probabilities of detection are indicated by different symbols and line types. The benefit for cheating, C, was held constant at 10. The area above a line is where an honest strategy is favored and the area below a line where a cheating strategy is favored. Note that the honest strategy is favored increasingly as the penalty for cheating increases, but much more shallowly than in Figure 1, with increasing probability of detection.

Fig 3a&b: Plagiarism rates across sections of Biology 101 decreased over time. 3a: Average "shared content" score decreased between semesters, and 3b: Percentage of papers with greater than 10% shared content decreased between semesters.

Fig 4a&b: Plagiarism rates were lower when students could view "shared content" score, and revise and resubmit if over allowable score. There was no significant incremental effect of a plagiarism class activity on plagiarism rates. 4a: Average "shared content" score, and 4b: Percentage of papers with greater than 10% shared content.

Fig 5a&b: Plagiarism rates were lower when writing assignments accounted for a larger proportion of the course grade. 5a: Average "shared content" score, and 5b: Percentage of papers with greater than 10% shared content.

Table 1

		Player 2		
		Honest	Cheater-Undetected	Cheater-Detected
Player 1	Honest	G_h	G_h	G_h
	Cheater-Undetected	G_c+C	G_c+C	G_c+C
	Cheater-Detected	$G_c+C-P(G_c+C)$	$G_c+C-P(G_c+C)$	$G_c+C-P(G_c+C)$

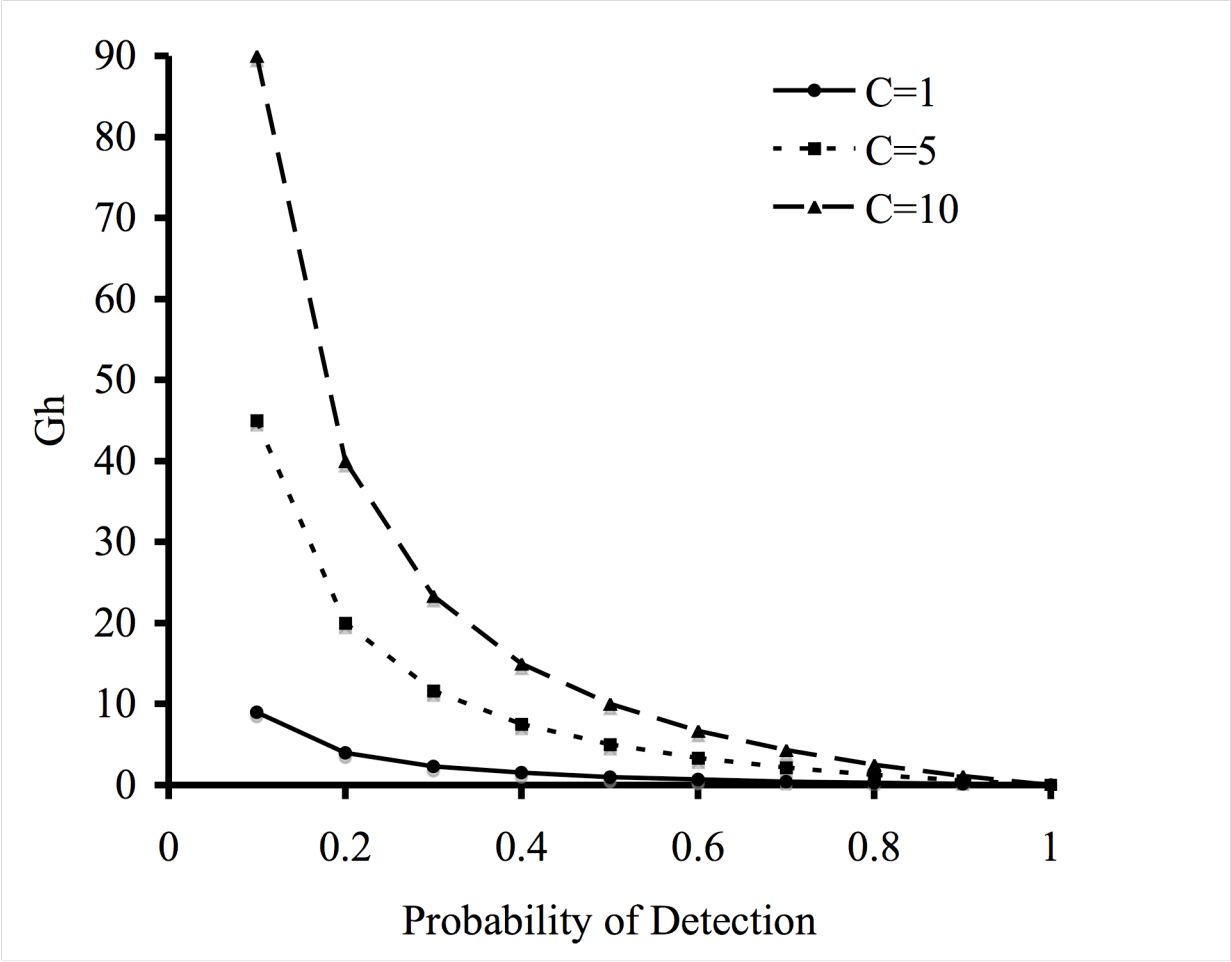

90
80
70
60
50
40
30
20
10
0
Gh
0
0.2
0.4
0.6
0.8
1
Probability of Detection
C=1
C=5
C=10

Figure 1

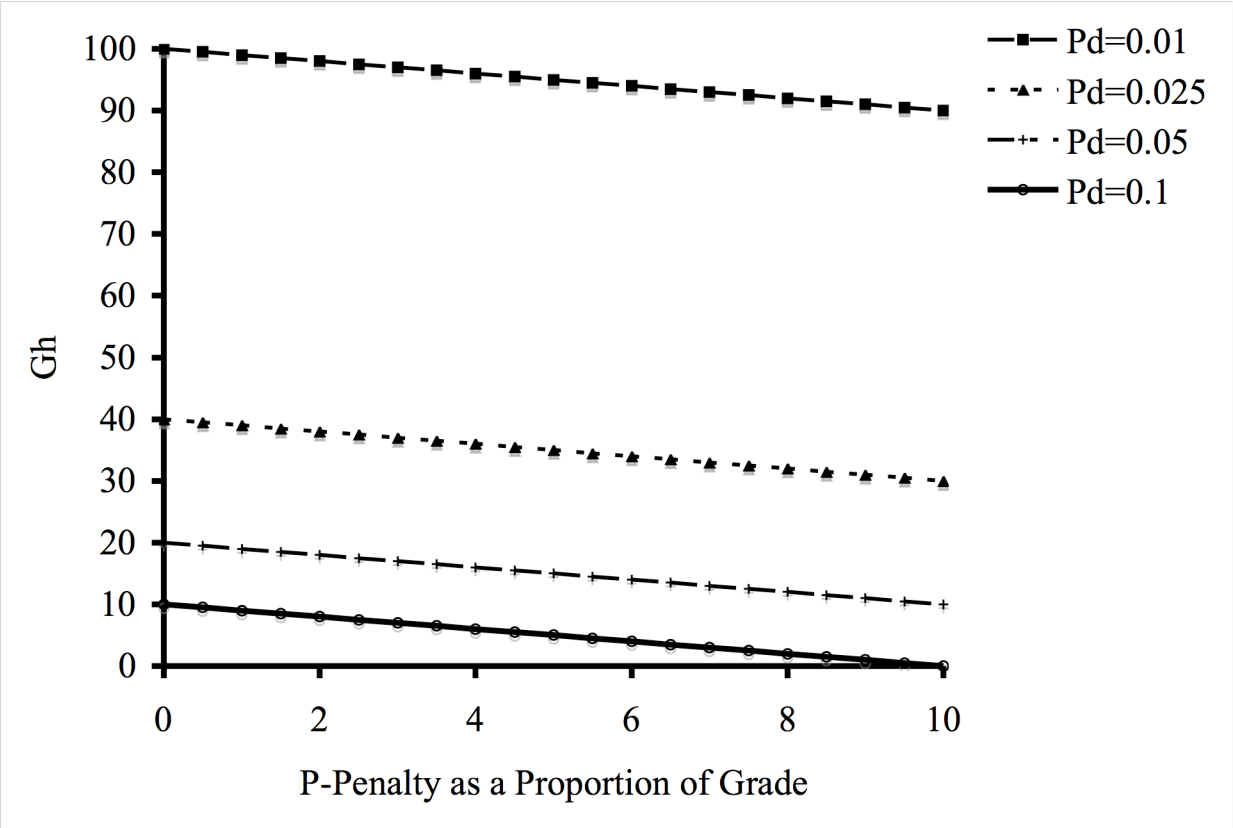
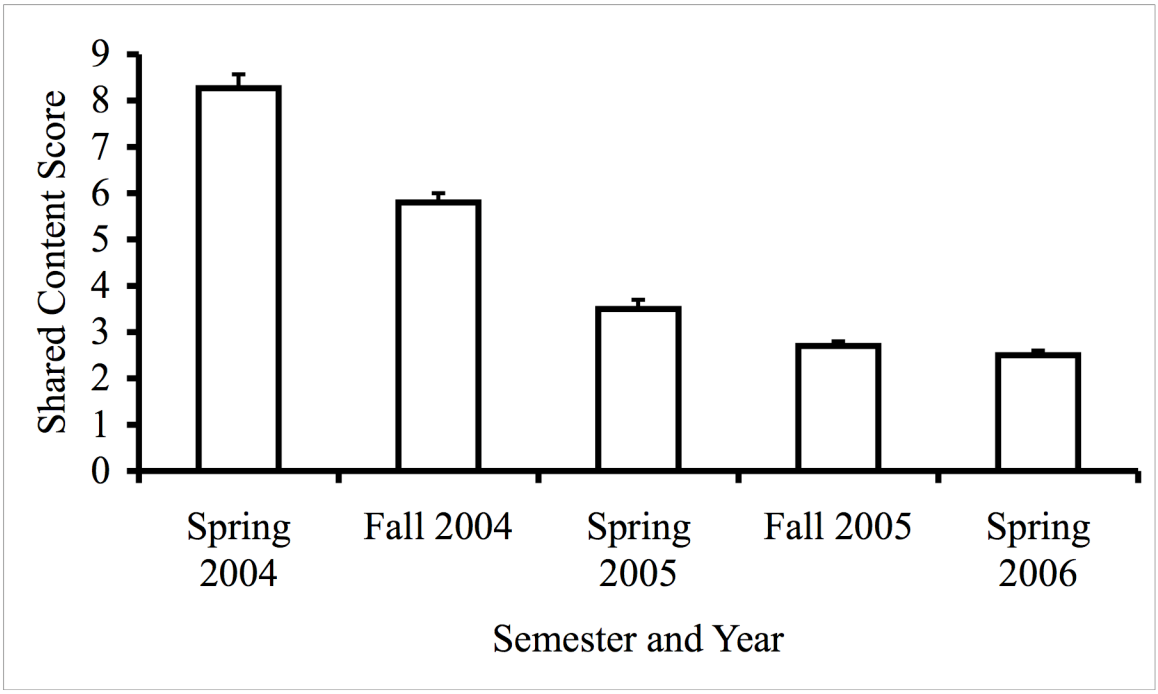

Pd=0.01
Pd=0.025
Pd=0.05
Pd=0.1
Gh
100
90
80
70
60
50
40
30
20
10
0
0
2
4
6
8
10
P-Penalty as a Proportion of Grade

Figure 2


Shared Content Score
9
8
7
6
5
4
3
2
1
0
Spring 2004
Fall 2004
Spring 2005
Fall 2005
Spring 2006
Semester and Year

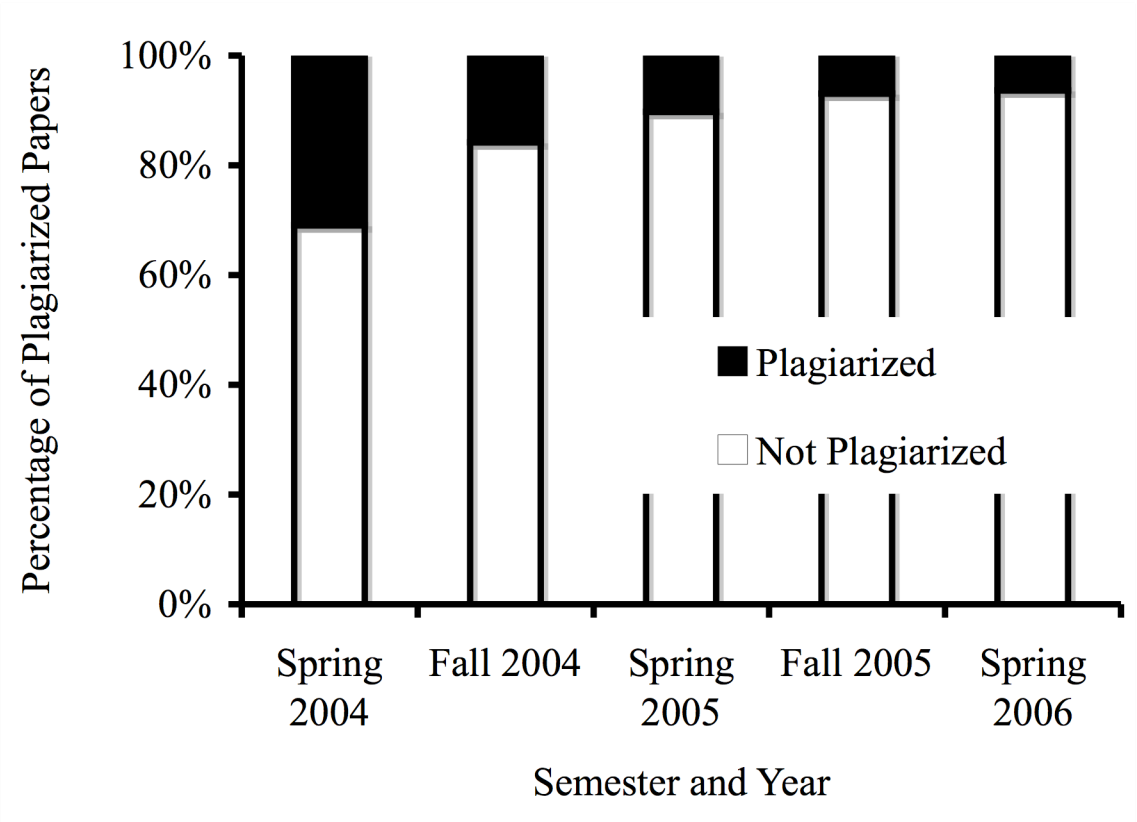
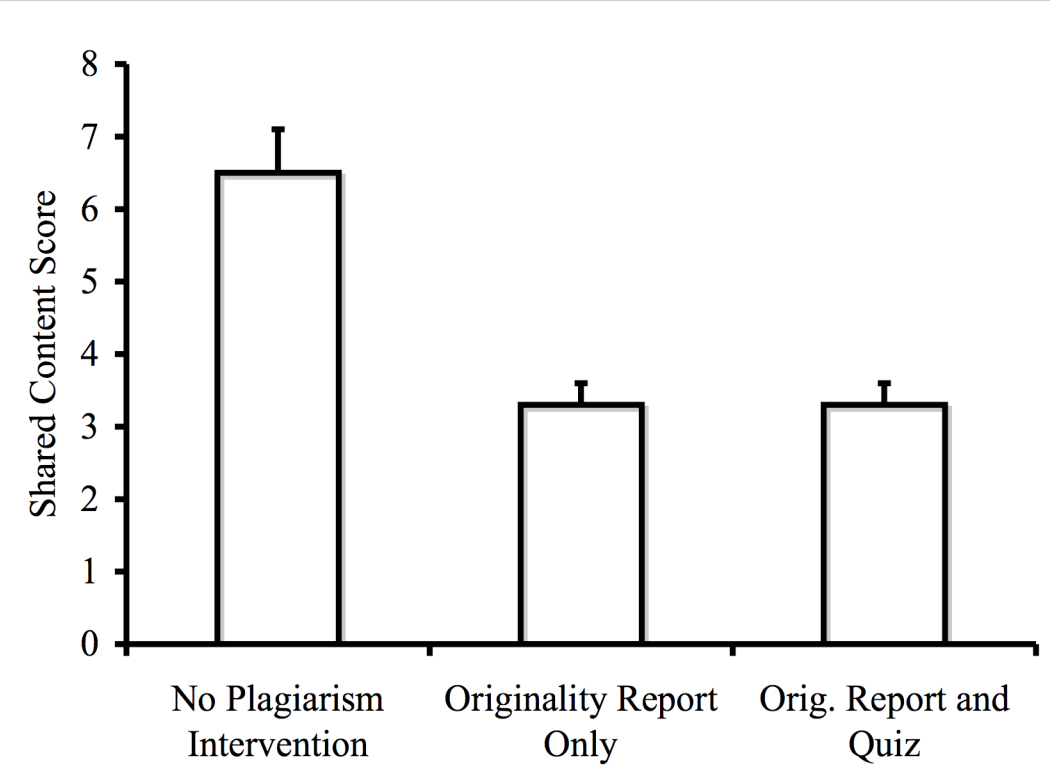

Percentage of Plagiarized Papers
100%
80%
60%
40%
20%
0%
Plagiarized
Not Plagiarized
Spring 2004
Fall 2004
Spring 2005
Fall 2005
Spring 2006
Semester and Year

Figure 3


Shared Content Score
8
7
6
5
4
3
2
1
0
No Plagiarism Intervention
Originality Report Only
Orig. Report and Quiz

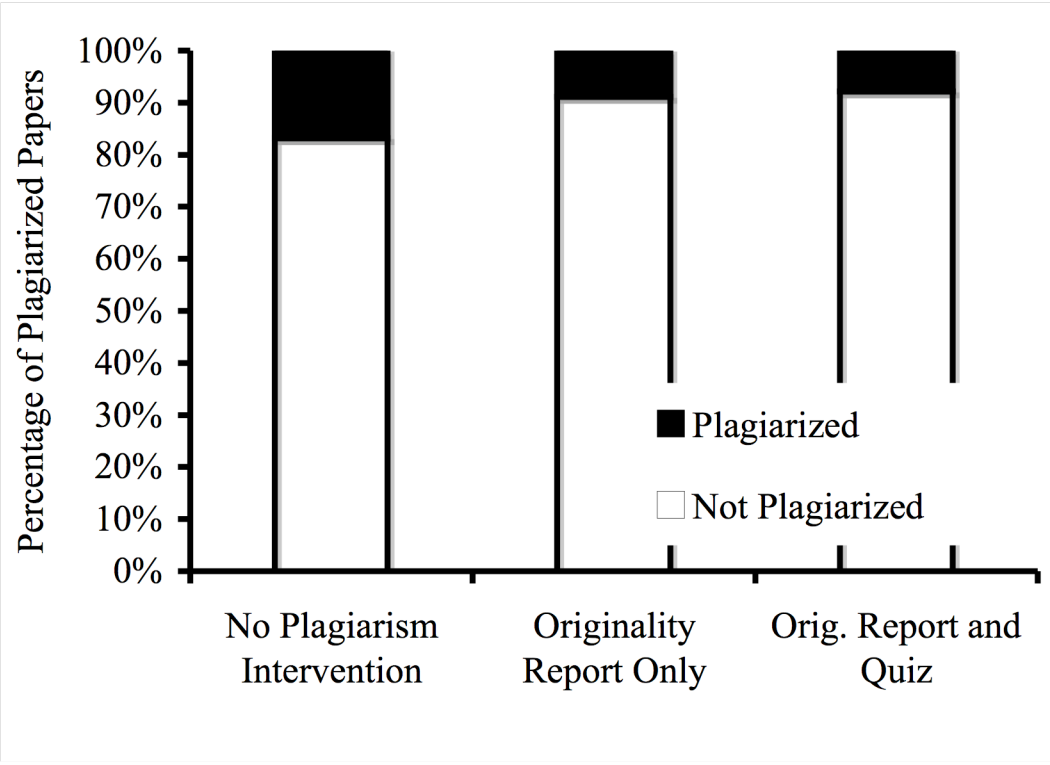
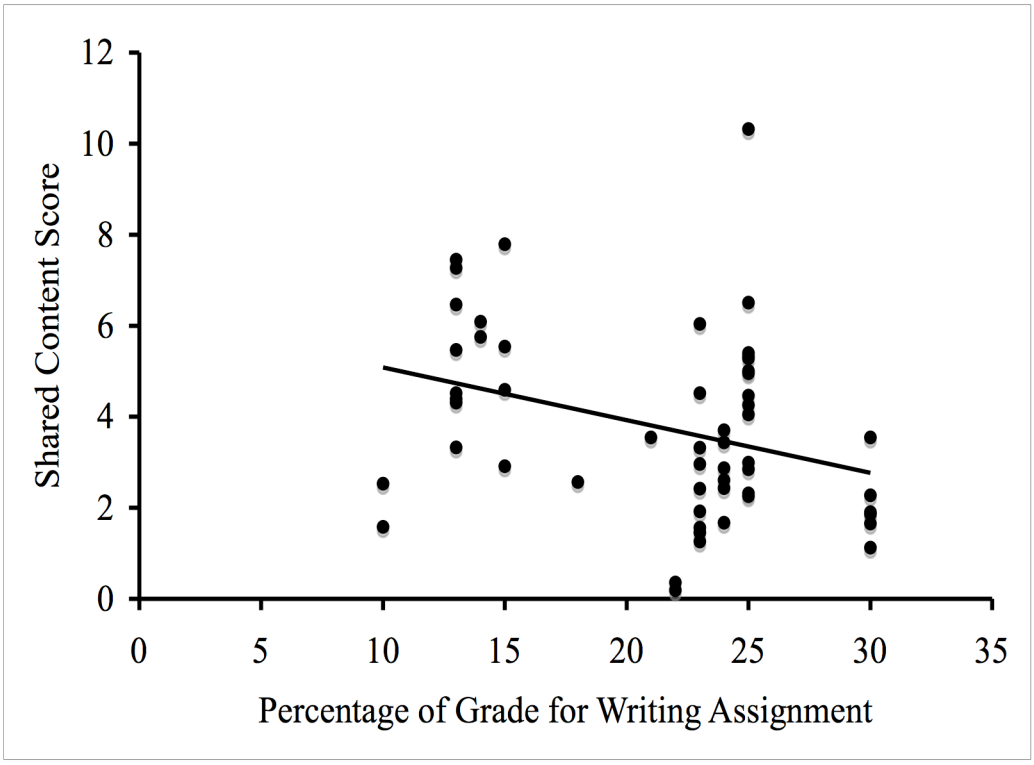

Percentage of Plagiarized Papers
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Plagiarized
Not Plagiarized
No Plagiarism Intervention
Originality Report Only
Orig. Report and Quiz

Figure 4


Shared Content Score
0
2
4
6
8
10
12
0
5
10
15
20
25
30
35
Percentage of Grade for Writing Assignment

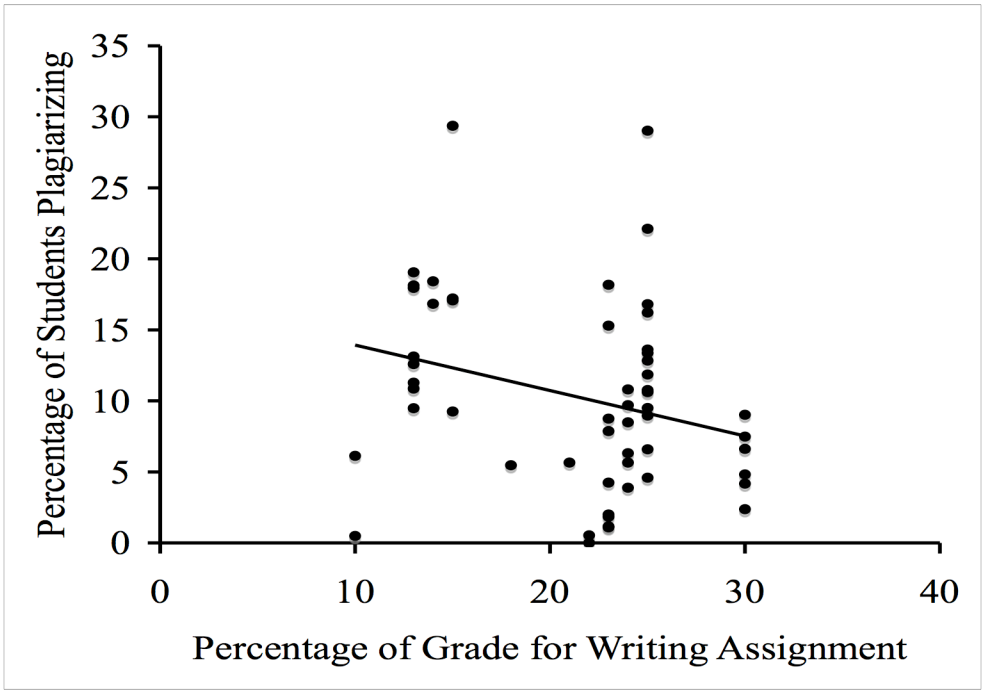

Percentage of Students Plagiarizing
0
5
10
15
20
25
30
35
0
10
20
30
40
Percentage of Grade for Writing Assignment

Figure 5