Motivating Student Performance: The Role of Accumulated Data in Grade Attainment

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Purpose of the Study: Applying the economic theory of information, the current study investigates how the inclusion/exclusion of accumulative performance data impacts achievement behavior.

Method/Design and Sample: A field observation study of 354 undergraduate students enrolled in four marketing courses (Marketing Channels, Advertising & Promotions, International Marketing, and Principles of Marketing) was conducted over two semesters.

Results: Overall, students in classes that were provided accumulative performance data outperformed groups that were not provided this information.

Value to Marketing Educators: The findings suggest that additional partial-information motives students to escalate their performance. The presence of accumulative data eliminates speculation (i.e., overestimating performance) and motivates achievement behaviors during the semester. The current findings offer an innovative, yet very simple way to motive students to elevate their performance.

Keywords: Motivation, grades, accumulative information

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The number of people graduating from American's postsecondary institutions has steadily increased over the last 59 years. In 1950, 497,000 students graduated from United States (USA) colleges and universities (U. S. National Center for Education Statistics [NCES], 2011). College graduates more than tripled by 1975 to 1,666,000, increased to 2,385,000 in 2000, and reached an all-time high of 3,025,000 in 2009 (NCES, 2011). This trend is expected to continue as the demand for jobs requiring postsecondary education increases. The shift to a "college economy" is driven by a greater reliance on technology, with these job replacing many blue collar jobs, and occupations as a whole requiring higher levels of education (Carnevale, Smith, & Strohl, 2010). In 1973, 25 million jobs in the USA required some college education: by 2007, the number of jobs quadruped to 91 million (Carnevale et al., 2010). By 2018 as the USA recovers from an economic recession, 33% of the new and replacement jobs will require a Bachelor degree or higher (Carnevale et al., 2010).

Although being college educated expands opportunities in the labor market, college educated workers are not immune to the effects of the worst recession in the USA since the Great Depression. The unemployment rate of college graduates was 5.1% in May 2010, up slightly from the previous year (4.8%), and higher than at any time since 1970 (Davidson, 2010; Rothstein, 2009). In November 2010, 2.4 million people with Bachelor degrees and higher were unemployed (Davidson, 2010). Today's labor market remains a thorny environment for all potential employees.

Sometime between the 1950s and 1960s, the major purpose of grading at institutions of higher learning changed. Once an internal measure and motivator of student performance, grades became a measure principally used for external evaluation (Rojstacer & Healy, 2010). Some research argues that grade point average (GPA), which once represented individual achievement, has continued to increase (i.e., grade inflation) with the greatest compression at the upper end (Rojstacer & Healy, 2010). Yet, test scores have not increased (Saenz & Barrera, 2007) and the literacy of graduates has declined (Kutner, Greenberg, & Baer, 2006). However, employers still turn to academic achievement as a proxy for skills such as problem-solving, organizational aptitude, and interpersonal communication skills (Gallaway & Johnson, 2007).

GPA has shown to be a good predictor of success in the short-run. Johnny C. Taylor, Jr., Senior Vice-President of Human Resources for IAC, a company with 33,000 employees worldwide and 60 businesses, says that "GPA is the best indicator an individual is likely to succeed…it demonstrates a strong work ethic and smarts" (Koeppl, 2006, p. 1). Although there are many criteria used to evaluate potential applicants, ceteris paribus, companies are more likely to interview and extend job offers to college graduates with a GPA of 3.4 or higher (Sundhelm, 2010). Employers' threshold of scholastic achievement is generally considered to be a 3.0 GPA (Gallaway & Johnson, 2007; Koeppel, 2006; Morsch, 2007). The value of a

high GPA brings forward the importance of motivating scholastic achievement among college students. The current study investigates how an educator might induce students to advance their level of performance (GPA), and therefore, increase their marketability in today's highly competitive labor market.

Although extensive research of psychological underpinnings of motivation exists (e.g., self-enhancement, need for accuracy), research of external elements, controlled by the educator, that may elicit motivation have yet to be undertaken in pedagogical research. To our knowledge, the current study is the first of such studies. Grounded in economic theory, this study compares differences in student performance when additional partial-information about their progress in class is provided. Specifically, this research investigates how accumulative performance information, presented by total points earned or total points lost, provided throughout the semester serves to motivate students to improve performance. A review of the literature, theoretical foundation, and development of hypotheses are followed by a discussion of methods used in the study, findings, and general discussion.

THEORETICAL FOUNDATION, RELEVANT LITERATURE, HYPOTHESES

The following literature review provides an overview of research of the relationship between behaviors and academic performance. Research of the relationship between behaviors such as attendance and exam performance reports consistent findings; absences and performance are negatively related (Grimes, 2002; Rau & Durand, 2000; Schuman, Walsh, Olson, & Etheridge, 1985). This relationship is consistent across courses in a variety of disciplines (e.g., Devadoss & Foltz, 1996; Durden & Ellis, 1995; Hammen & Kelland, 1994; Park & Kerr, 1990; Romer, 1993; Shimoff & Catania, 2001). Research of some intuitive relationships report mixed findings. Although little research exists, it is generally assumed that time spent studying is directly related to performance (Grimes, 2002). Schuman and colleagues' (1985) research failed to support a relationship between time spent studying and exam performance. Rau and Durand (2000) suggest that when students study and what they do when they are not studying are more related to performance than time spent studying. Similar inconsistencies are evident in the relationship between self-handicapping (use of excuses given prior to possible negative performance) and performance. Although an inverse relationship between proclivity to self-handicap and GPA and SAT/ACT is reported for athletes (Rhodewalt 1990; Rhodewalt, Saltzman, & Whittmer, 1984), findings across academic settings are not evident (e.g., Feick & Rhodewalt, 1997; Greenberg, Pyszcynski, & Paisley, 1984; Harris & Snyder, 1986).

Motivation

Research suggests that achievement behavior is an outcome of the interaction between an individual's motivation to achieve and situational factors (Brunstein & Maier, 2005). Individual motivation to achieve consists of several types of motives. *Explicit* motives are externally stimulated and drive deliberate choices, while *implicit* motives are affective associative networks rooted in the midbrain (Koestner, Weinberger, & McClelland, 1991; McClelland, Koestner, & Weinberger, 1989; Weinberger & McClelland, 1990). *Self-attributed* motives are cognitive schemas representing one's values (Thrash & Elliot, 2002). Individual motives tend to work together to direct behavior.

Achievement Goal Theory (AGT) seeks to explain the purpose/reason student purse an achievement task and the criteria used to evaluate their competence (Urdan, 1977). Several models of AGT have emerged in the literature. Dweck and Leggett (1988) propose that achievement goals can be strongly influenced by individual characteristics, while Ames (1992) suggests that contextual factors such as classroom structure influence motivation. By contrast, Dweck and Leggett (1988) argue that achievement goals are more stable, while Ames (1992) argues that achievement goals are more malleable.

Economic Theory

Economic theory suggests that partial information is inferior to complete information (Chung & Ely, 2003). When people have access to complete information, they perform better and make better choices overall. For example Ahituv, Igbaria, and Sella (1998) found that complete information improved air-force commanders' performance in the absence of time pressure. Although extensive literature of complete/incomplete information and performance exists in economic research (e.g., Antonelli & Teubal, 2008; Stigler, 1961; Stiglitz, 2000), the current study considers research that addresses the addition of partial information and the presentation of such information. Geri, Neumann, Schocken, and Tobin (2008) found that additional partial information increases an individual's ability to choose the best course of action. Chervany and Dickson's (1974) research employed a simulated, computer-based decision experiment to test two groups; one group was provided with raw, un-aggregated production data and other group received statistical production data in summary format. Members of the aggregated data group outperformed (i.e., made better decisions) than the group with un-aggregated data.

Motivation to act/not to act is a matter of external stimulus (i.e., *explicit)* and internal factors (i.e., *implicit* and *self-attributed).* Research suggests that the inclusion of additional partial information presented in an aggregated form motivates (i.e., external stimulus) individuals to act (i.e., take steps to improve performance). Accumulative points, provided to students throughout the semester, are used as partial information in the current study. Students are provided with summations of points that they have accrued

throughout the duration of the course. Hence, the following relationship is hypothesized.

H₁: Students provided with *accumulative points earned* to date information will outperform students not provided accumulative information.

Elliot and colleagues (Elliot & Church, 1997; Elliot & McGregor, 1999) put forward a hierarchal model of achievement motivation. This model differentiates achievement goals by valence (i.e., whether the goal focuses on positive outcome or avoidance of a negative outcome) and definition (i.e., focused on development of competence or task mastery). Elliot and McGregor (2001) found that three distinct combinations of goals are especially prevalent in the college classroom: 1) *mastery-approach* goals focus on developing competence or task mastery, 2) *performance-approach* goals focuses on outperforming others, and 3) *performance-avoidance* goals focus on not performing worse than others. *Mastery-approach goals* support intrinsic motivation, but have no affect on grade performance; *performance-avoidance goals* are detrimental to both intrinsic motivation and grade performance; and, *performance-approach goals* are not related to intrinsic motivation, but are positively related to grade performance (Elliott & Church, 1997).

The presence of partial information (Geri, Neumann, Schocken, & Tobin, 2008), whether negative-focused or positive-focused (Elliot & McGregor 2001), is an achievement motivator. Therefore, the presence of negative-focuses (accumulative points lost) will motivate students to elevate their performance. Hence, the following relationship is hypothesized.

H₂: Students provided with *accumulative points lost* to date information, will outperform students not provided with accumulative information.

METHOD

Field observation is used to test the hypothesized relationship. Students from a Southern USA university make up the participants of this study. An automated system that students typically use to view grades during the semester (i.e., *VISTA*) is the grade delivery system of the current study. Student grades are posted to *VISTA* when assignments/exams are completed. Class syllabi include a requirement that students review grades immediately following posting to *VISTA*; failure to do so results in forfeiture of the student's right to correct posting errors. During the two class meetings following the posting of grades, instructors remind students of the requirement to review grades and questions about same are solicited.

Accumulative information allows students to evaluate their performance throughout the semester. For example, in a class where the total potential points for the course are 100, a student that wants to earn and "A" knows that he/she could lose 10 points before the desired "A" is no longer attainable (i.e., accumulative points lost to date). Likewise, when accumulative points earned to date data are reported, the student knows that he/she must earn at least 90 points to make an "A."

Data are collected over two time periods (i.e., semesters) for four marketing courses: Marketing Channels, Advertising & Promotions, International Marketing, and Principles of Marketing. Classes used in this study are consistently taught by the participating instructors (i.e., no new preparations). The delivery of information (i.e., lectures), syllabi, requirements (i.e., number of exams and other assignments), and grading are consistent over the data collection semesters.

Students in the first period serve as the control group. These students were able to view their grades, but no accumulative data were provided (see Table 1). This is the standard presentation style and the default option used by academic software such as *VISTA*. Anecdotal evidence (i.e., interviewing faculty) suggests that most faculty use the default presentation style offered by *VISTA*.

Table 1. Example of Grade Presentation with No Accumulative Grade Information

Exam 1 (100 pts.)	Exam 2 (100 pts.)	Exam 3 (100 pts.)	Quiz 1 (20 pts.)	Quiz 2 (20 pts.)	Quiz 3 (20 pts.)	Paper (100 pts.)	Participation (40 pts.)
82	82		10	11	8	70	

During period two, students viewed additional partial-information. In addition to their grades for each assignment, half of the participants viewed a column showing accumulative points earned to date and half viewed a column showing accumulative points lost to date. The accumulative information was accompanied by a template showing the letter grade brackets allocated to various range of points earned/lost (see Tables 2 and 3).

Using a *VISTA* option, the points earned to date column automatically calculated and updated accumulative data when new grades were posted or changes were made to previously posted grades. To calculate the accumulative points lost to data, an algorithm was developed and loaded to *VISTA*. Each time new grades were posted or an existing grade changed, the program automatically calculated and updated accumulative points lost to date.

To test the hypothesized relationships, student performance on exams was considered. Exams are used in the study, because they are objective in nature (i.e., multiple choice and true/false questions) and not subject to subjective evaluation (i.e., written papers, presentations, and participation), eliminating potential grading bias. Classes used in this study were taught by the same two professors (i.e., one professor taught Principles of Marketing and the other professor taught Marketing Channels, International Marketing, and Advertising and Promotions).

Three exams (per semester) were given in all classes used in this study. To examine the motivational quality (i.e., initiates action to improve performance) of additional partial-information, difference in performance between the last two exams is considered. The difference between the first and second exam is not considered, because poor performance on exam one might be attributed to extenuating factors such as student's acclimation to teaching styles or misevaluation of expectations by the student. Therefore, it is possible that a larger difference observed between exams one and two might inflate the results of the study.

Table 2. Example of Grade Presentation with Accumulated Grade Information by Points Earned

Exam 1 (100 pts.)	Exam 2 (100 pts.)	Exam 3 (100 pts.)	Quiz 1 (20 pts.)	Quiz 2 (20 pts.)	Quiz 3 (20 pts.)	Paper (100 pts.)	Participation (40 pts.)	Earned To Date
82	82		10	11	8	70		263

A = 450 – 500 points, B = 400 – 449 points, C = 350 – 399 points, D = 300 – 349 points, F = <300 points

Table 3. Example of Grade Presentation with Accumulated Grade Information by Points Lost

Exam 1 (100 pts.)	Exam 2 (100 pts.)	Exam 3 (100 pts.)	Quiz 1 (20 pts.)	Quiz 2 (20 pts.)	Quiz 3 (20 pts.)	Paper (100 pts.)	Participation (40 pts.)	Lost To Date
82	82		10	11	8	70		97

A = Loss of no more than 50 points, B = Loss of no more than 100 points, C = Loss of no more than 150 points, D = Loss of no more than 200 points, F = Loss of more than 200 points

RESULTS

The sample for period one (i.e., control groups) consists of 149 undergraduate students enrolled in Marketing Channels (38), International Marketing (45), Advertising and Promotions (33), and Principles of Marketing (33). The sample for period two (i.e., treatment groups) consists of 205 undergraduate students enrolled in Marketing Channels (48), International Marketing (41), Advertising and Promotions (40), and Principles of Marketing (76) (see Table 4).

Conversations during teacher/student conferences confirmed that students reviewed grade posted to *VISTA*. Student comments such as "I only have 10 points to give and I will lose my A" and "I have to make an A on the [next] exam to keep my B" were common among students.

The performance differences (i.e., increase/decrease in mean grades) between the last two exams were calculated for all groups (i.e., control groups, treatment groups provided with accumulative points earned to date and treatment groups provided with accumulative points lost to date) and subjected to independent *t*-test analyses (see Table 4). Significant differences were found ($p < .001$) for all classes provided with points lost information, except International Marketing treatment group (see Table 5). While the average grade for exam three decreased in three out of four control groups, performance of students in the treatment groups increased. Hence, H1 was supported and H2 was partially supported.

Table 4. Mean Differences Between Last Two Exams

Group		Class	Data Presentation	N	Average Test Grade (normalized) 2nd Last Exam	Last Exam	Mean Diff.
Period One	Control Groups	Marketing Channels	None	38	78.13	67.45	-10.68
		International Marketing	None	45	83.22	83.15	-0.06
		Advertising & Promotions	None	33	76.68	72.60	-4.08
		Principles of Marketing	None	33	78.24	78.93	0.69
		Overall		**149**	**79.37**	**75.87**	**-3.50**
Period Two	Treatment Groups	Marketing Channels	Points Earned	22	76.95	88.05	11.09
			Points Lost	26	81.19	89.08	7.88
		International Marketing	Points Earned	22	77.59	83.45	5.86
			Points Lost	19	79.47	81.37	1.89
		Advertising & Promotions	Points Earned	19	77.65	85.74	8.09
			Points Lost	21	75.28	81.00	5.71
		Principles of Marketing	Points Earned	37	79.10	85.81	6.70
			Points Lost	39	75.69	81.87	6.17
		Overall		**205**	**77.83**	**84.55**	**6.72**

Table 5. T-Test Summary

Treatment Group		Δ Average Test Grades Treatment	Control	Mean Δ Between Groups	t-value	Sig.	Standard Error
Marketing Channels	Points Earned	11.09	-10.68	21.76	6.49	.00	3.35
	Points Lost	7.88	-10.68	18.57	6.04	.00	3.07
International Marketing	Points Earned	5.86	-0.06	5.93	1.82	.07	3.25
	Points Lost	1.89	-0.06	1.96	0.50	.61	3.86
Advertising & Promotions	Points Earned	8.09	-4.08	12.17	3.17	.00	3.84
	Points Lost	5.71	-4.08	9.79	2.92	.00	3.36
Principles of Marketing	Points Earned	6.70	0.69	6.01	3.32	.00	1.80
	Points Lost	6.17	0.69	5.48	3.00	.00	1.82

DISCUSSION

Although grade inflation remains a widely contested topic among academicians, research by the U. S. Department of Education reports that university/college grades have declined in the last two decades (Kohn, 2002). A review of college students' 1999-2000 transcripts reveals that 33.5% of USA undergraduates had a GPA of "C" or below (Kohn, 2002). In an age where students view education as any other economic exchange (i.e., ticket to a better job), motivating students to elevate their performance is a challenge for marketing educators (Lippmann,

Bulanda, & Wagenaar, 2009). The findings suggest that the inclusion of additional partial-information serves to meet this challenge. When students are provided accumulative performance data, either as points earned or points lost to date, they act to improve their position (i.e., do better on subsequent assessments). They work harder when they know where they stand in the course. When additional data are available (whether presented as points earned or points lost) it motivates students to do better to achieve their desired grades. The additional partial-information is a predictive gauge that solicits achievement behavior through explicit motivation.

Furthermore, the inclusion of this information on *VISTA* (the grades earned) is an easy task that does not require major programming changes.

Anecdotal evidence collected over years of teaching experience suggests that students do not translate disaggregated data about their grades during the semester. A common complaint voiced by students at the end of the semester is, "I don't know how I made such a low grade .... I thought I was doing well." The simple addition of accumulative data resolves this issue.

The presence of accumulative data, whether positive-focused or negative-focus, was sufficient to solicit students to elevate their performance. This finding is consistent with exiting literature (i.e., Elliot & McGregor 2001). Notwithstanding this finding, both professors noticed that students shown "points lost to date" engaged in more conversations about their grades noting their current position (i.e., I only have 20 more points to lose to keep a B), and solicited conversation with their professor more often than students shown "points earned to date." Overall, students in the treatment groups solicited professors' attention concerning their grades more often than students in the control groups.

The non-significant difference between the International Marketing treatment group (i.e., points lost) and the control group was unexpected. It is possible that both International Marketing groups consisted of students that were motivated to achieve and engaged in self-monitoring. A logical explanation is that these students demonstrated achievement behavior prior to taking the class; average GPA of 2.95 for control group and 3.09 for treatment group. However, alternative explanations cannot be ruled out and further research is warranted.

As with all research, there are limitations to the current study. First, the sample is limited to one university. It is possible that findings of this study might not be generalizable across universities. Second, although all precautions were taken to eliminate bias (i.e., same professors taught both control and treatments groups, assessment using subjective evaluation was not considered, and the curriculum requirements were consistent among control and treatment groups), it is not possible to hold all variables constant (i.e., equivalent class time allocated to each exam and standardized lectures).

In summary, the current findings offer an innovative, yet very simple way to motivate students to elevate their performance. The presence of accumulative data eliminates speculation (i.e., overestimating performance) and motivates achievement behaviors during the semester. No matter what the force (i.e., goal focused on positive outcome, avoiding a negative outcome and/or development of competence or task mastery), students are empowered to control their own fate. From this perspective, students learn to take responsibility for their performance.

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