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A Test of Student Grade Satisficing by Experimentally Inducing Time Stress

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Abstract

Scholars studying scholastic achievement in higher education find that students have specific course grades in mind that satisfy their desires for academic performance. When students believe that they are on-track to achieve those grades, they divert resources to other endeavors. This paper tests a resulting hypothesis: Students balance higher grades on easier assignments with lower grades on more difficult ones. After experimentally inducing time stress by assigning students to participate in an experiential learning exercise, those busier with volunteer work did balance their higher grades on the easier, experiential assignments, against lower ones on the course exams. Additionally, the time stress produced a strong interaction effect. Among the busier students, the time stress reduced their course grades (those not related to the experiential learning), while among the less busy, those grades increased. Instructors should be aware that some course activities are less linked to learning than others. The educational consequence of student grade satisficing is that when instructors offer more credit for easier activities, which are less linked to student learning, they may be reducing learning overall. The role of grade satisficing in reducing students' acquisition of knowledge is an under-explored topic, but it has powerful implications for student learning.

Keywords: experiential learning, experimental design, grade satisficing, research methods, time stress

1. Introduction

College students' academic goals affect the efforts they put into their schoolwork, which in turn affects their scholastic performance and learning (e.g. Marshall, 2018). More specifically, students can be thought of as either grade maximizers, or grade satisficers (Hadsell & MacDermott, 2010, Stohs, 2016). Grade maximizing students would push themselves to achieve the highest grades possible, making sacrifices in their lives to achieve such grades as the most important goal. In contrast, grade satisficing students would have a certain performance level in mind that, once achieved, would lead them to divert resources to other endeavors. These students would make greater trade-offs when balancing their college performances with other goals in their lives. Scholars who study the motivations of college students consistently find them to be grade satisficers – their academic performance is a function of balance between many goals (Krohn & O'Connor, 2005). The performance goals, of course, are to achieve certain course grades. In general, students do not attempt to get the very most out of their college courses that they possibly can. Instead, in the language of the scholars who study college student motivation and behavior, they maximize their overall utility by balancing the utility they get from a particular course grade with the utility that they get from the other aspects of their lives, such as other course grades, leisure, working, etc. (Chadi, Pinto & Schultze, 2019).

The implications of students' grade satisficing have only been directly and explicitly explored in one study (Hadsell & MacDermott, 2010). These authors find evidence of grade satisficing – the higher students' earlier exam grades are, the less likely they are to take an optional exam to increase their final course grade. This paper proposes another such implication of grade satisficing behavior: Students will maximize the parts of their course grade that are easiest to achieve, balancing those higher grades with lower ones on the course components that are more difficult to achieve. In many Western nations, college/university syllabi typically award course credit for: Exams, papers, and participation. In addition, professors commonly offer extra credit. There is also an established but relatively new phenomenon in American higher education of giving service learning assignments, in which college students perform tasks in the community that are ostensibly related to course content. Grade

satisficing students should earn lower grades on the more difficult course assignments, such as exams and papers, as they earn higher grades on the easier components, such as participation and extra credit. If this hypothesis holds, it leads to the possibility that as professors structure "soft assignments" into their courses that are worth a greater share of the course grade -- but that also cause comparatively less learning -- then overall learning in a course may decrease. Decreased learning would hold if student activities like class participation and extra credit lead to less learning than do the exams, and the writing assignments. For example, scholars find inconsistent results regarding whether or not class participation increases learning (see Frymier and Houser 2015 for a review).

This paper tests the grade-trade off, or grade balancing, hypothesis, by reporting the results of an experimental design in which social science research methods students in the U.S. were randomly assigned to an experiential learning treatment in which they had more work to complete than the other students in the course. Experiential learning involves students putting learned course knowledge and skills to use in real-world applications (e.g. Warren, 2012). Importantly, the experiential learning project was largely graded based on completion, whereas the course exams were, of course, graded based on the correctness of the answers. If students are, in general, grade satisficers, then the first hypothesis is that the average course grade for the control and treatment groups should be the same. The "target grade," the grade that satisfies students' goals, should be the same in the control and treatment groups. However, if students are grade satisficers, then in the treatment group, the time stress stimulus should affect students differently depending on, among other factors, how much time stress they are under to begin with. The students facing more time stress should balance higher experiential learning project grades with lower grades on the other assignments. In contrast, less time stressed students should not.

2. Theory

2.1 Grade Satisficing and Student Stress

Several streams of research concerning the motivators of college students lead to the conclusion that college students are, "grade satisficers." While only Hadsell and MacDermott (2010) and Stohs (2016) explicitly use the term "grade satisficing," the other authors I cite here describe the same phenomenon without labeling it as such.

The first set of scholars work in the economics literature concerning how students set their college priorities. One set of researchers propose a model of student achievement in which students allocate time to study for an exam based on the maximization of their expected utility. The expected utility is a function of the balance between that which they receive from the exam grade, versus the utility they receive from the time spent on something other than studying for the exam (such as time spent on other courses, paid employment, recreation, sleeping, etc.; Krohn & O'Connor, 2005). In other words, when students choose to spend time on a course, they spend less time on other valuable pursuits (Allgood, 2001). Krohn and O'Connor (2005) find that as students earn higher midterm exam grades, they reduce the amount of time they subsequently allocate to studying for the course. Furthermore, when students perform better on earlier exams, they reduce their efforts on later ones (Bonesronning and Opstad 2015). Other scholars find that students who score higher on the SAT tend to be more academically disengaged once they reach college (Brint and Cantwell, 2014). Another group of scholars find that student ability has a negative effect on effort (Chadi, Pinto & Schultze, 2019). This is because the marginal gain of increasing effort after studying is lower for high-ability students compared to low-ability students. As a result, the authors conclude that rather than maximize their grades, students are grade satisficers, and, "[H]igh ability students use their advantage over low ability ones to obtain additional utility by having more leisure time…. [T]his empirical result supports the notion of the 'lazy genius' who puts comparatively little effort into studying." (Chadi, Pinto & Schultze, 2019).

Of course, there are many students who would surely like to put more effort into studying. There are multiple streams of research showing that, given the socioeconomic realities of many Western societies, especially the United States, many students face real barriers and challenges to being so-called "grade maximizers" -- even if they wanted to. For one, students routinely indicate that they cannot economically afford to make such choices. Nonis and Hudson (2002) report the results of surveys in the U.S. showing that 2/3rds of college students say that they are concerned with having enough money to complete college. Surveys of college students in other countries, including some European ones, produce similar results (such as Germany; Behr & Theune, 2016). Many college students hold jobs to help defray college expenses, with studies showing that this leads to: Students taking longer to graduate (Behr and Theune, 2016), lower grades (Sanchez-Gelabert, Figueroa & Elias, 2017), and higher drop-out rates (Hovdhaugen, 2015). The economic pressures apparently have direct effects on students by leading them to spend time working when they seemingly would be focusing on their studies.

University students face many other sources of time pressure as well. A review of the college student time stress

literature catalogs 29 sources of stress for college students (Hurst, Baranik & Francis, 2013). One of these is extra-curricular activities, which include volunteering and community service. An analysis of survey data from over 100,000 college/university students in 18 OECD nations finds that in all nations, people with more education engage in greater community service (Gong & Hong, 2021). Among the various kinds of extra-curricular activities that college students can engage in, this one in particular leads to stress, and students who earn lower grades do in fact spend more of their time being busy with volunteer work, compared to students with higher grades (Beban & Trueman, 2018). Student time spent volunteering is particularly interesting to consider as a source of student stress because its effect is seemingly moderate compared to some other sources (e.g. Hurst, Baranik & Francis, 2013).

Amirkhan, Bowers and Logan (2020) find that stress overload relates to poorer performance in school. As time pressures increase, students turn away from the kind of deep learning (so-called "goal mastery orientation") that educators hope for, and instead adopt strategies to avoid or minimize the stress in the easiest way possible (so-called, "state performance-avoid goal orientation;" Beck & Schmidt, 2013). People in an avoid-goal orientation mindset eschew seeking help (Middleton & Midgley, 1997). This is because high time pressure leads to: Increased psychological strain, fatigue, and burnout (Sonnentag, 2011). Feelings of stress even cause negative psychological and health effects (see Pascoe, Hetrick & Parker, 2019 for a review). These kinds of pressures may lead to the conclusion of one set of scholars, who find that, when low performing students know their grades will be lower, they do not study more or improve (Miller & Geraci, 2011). Another set of scholars succinctly summarize the overall negative effect of time pressures when they write, "Given the importance of grades as ends in and of themselves, when time is in short supply, a focus on learning and development may take a backseat to simply 'getting a good grade'" (Beck and Schmidt, 2013).

2.2 Grade Satisficers Balance Higher Scores on Easier Assignments with Lower Grades on Harder Ones

There are surely many consequences of grade satisficing, but the one explored in this paper is that students might balance their higher grades on easier assignments with lower grades on harder ones. They would do so because they have targets in mind for their own course grades, and achieving those course grades involves trade-offs between investing time and effort into the courses, versus time and effort in other aspects of life. The more easily students can achieve the desired grades, the more they can devote time and effort to other competing priorities.

As an example of easier course activities, professors in some Western nations award students extra credit. Sometimes they award the extra credit simply for their attendance at an event, like a public lecture (or museum, such as in Italy; Lattarulo, Mariani & Razzolini, 2017). However, this kind of extra credit may be the worst kind, because grade satisficing students will earn lower grades on the harder assignments, such as exams or research papers, the more the easy extra credit increases the final course grade. There are, however, examples of extra credit activities that probably do lead to direct learning, such as awarding it to students when they use an on-line system to study (Parker & Loudon, 2013), for improved study habits (Junn, 1995), or for higher attendance in a language class (Prior, 2018). The point is: If student learning is educators' chief goal, extra credit has to be awarded thoughtfully, and the greater the extra credit, the more careful the instructor should be.

Professors also commonly assign course grades based on class participation. However, scholars find only inconsistent links between greater participation and greater learning, or grades (see Frymier & Houser, 2015 for a review). One finding that explains a weak link between class participation and learning is that when engaging in class participation, about a quarter of students do not take part in a substantive and deep way, instead doing what the authors term, "pretending to engage" (Fuller at al., 2018). When professors award greater credit for participation, this creates greater opportunities for students to learn less, in the sense of writing lesser papers, or preparing less for exams.

This begs the question -- what share of course grades do professors actually allocate to class participation? In an effort to assess this, I perused the syllabi that are posted on the website of my home academic discipline, the International Society of Political Psychology. I downloaded all of the syllabi from the website, from courses taught in English around the world, and considered the ones that clearly listed a percent of class participation that would count toward the final course grade. This ended up being 17 syllabi. The mean percent of the course grade counting toward participation was 18.4%, while the median and mode were both 20%. The standard deviation was 9.8%. The values ranged from a low of 5%, to a whopping 50%. As the analyses presented later in the paper demonstrate, values that are this high provide clear opportunities for students to maximize their participation grade, in exchange for lower grades on the assignments that are more clearly linked to actual learning and skill acquisition. Of course, learning may not be the ultimate goal that professors seek when they encourage class participation in this way, but educators should give careful thought as to why we encourage participation in class

and how we reward it.

No previous study of the effects of time stress on students has experimentally manipulated the focal variable. This is a major short-coming in the literature concerning the effects of time stress because when students choose to spend time on non-academic tasks, time allocation is endogenous to all other related variables (see Grave, 2011; Delavande, Del Bono & Holford, 2020, for discussions of this challenge). As alluded to earlier, in Western democracies, it is common for college students to have to work so that they can pay for their college educations. Studies find that these work responsibilities lower academic achievement (e.g. Sanchez-Gelabert, Figueroa & Elias, 2017). However, is that a causal relationship? One can imagine a good number of possible confounding factors, such as the socioeconomic status of the students' families. That in and of itself could lead to lower academic achievement, independent of student job obligations. In conclusion, any correlations from observational data between factors that impact students' studying efforts and academic outcomes cannot be interpreted causally.

3. Methodology

3.1 Experimental Design

In the fall of 2014, 45 students enrolled in a political science research methods course at a public Midwestern university in the U.S. To induce time stress among the students, I randomly assigned half of them to complete an experiential learning project. I intended to increase student time stress in such a manner that would also deepen and enrich the student experience of conducting research. In a review of the literature concerning experiential learning in research methods classes, Earley (2014, 248) writes, "The main lesson to be learned from the current literature on teaching and learning research methods is teachers need to use active learning approaches to teaching the course in a way that provides hands-on exposure to research methods." At this particular university, the type of experiential learning called service learning is one of the core missions of the university. The university leadership cites as one its main missions to be engaged with the community, and there is an entire service learning office. To facilitate this service learning project, the professor coordinated with an employee of the local school district and arranged for the college students in the project to interview high school students who met in after school clubs for members of migrant families. The professor wrote a draft of the survey, which measured political knowledge and civic attitudes. The purpose of the survey was to study the link between political knowledge and civic attitudes among the migrant population.

A downside to using this experimental design is that it may raise ethical concerns for some. If the researcher expected the students to benefit from the experiential learning treatment (as the reader will see, this did not come to pass, as the academic performance in the treatment and control groups were the same), then students in the control group are being deprived of that benefit. In addition, inducing stress may, of course, raise its own ethical quandaries. However, scholars find that moderate increases in time stress can actually *increase* productivity and performance (Gross, 1994; Isenberg, 1981; Janis & Mann, 1977; Latham & Locke, 1975). This is something important to keep in mind when considering the ethical implications of inducing student time stress. It was not clear that this design would necessarily reduce student academic performance, even among the busier students. It could have enhanced it. The unclear effect of the time stress on the students is part of why the study was approved by the local human subjects board (IRB # 040-18-EX).

Concerning the experiment itself, I now describe the timeline of the project. After the semester started, all of the students in the course read about, and received a lecture on, survey interviewing. The professor then passed out a draft of the proposed survey instrument, to the students selected into the experimental treatment, and the students emailed critiques to him. He then followed up by updating the instrument in response to the critiques, and the college students interviewed the migrant high school students at two different high schools on September 25 and 26. The migrant students were paid $10 for completing the surveys. The interview session lasted less than an hour. One hundred high school students completed the surveys in a paper and pencil format, and the college students collected them and submitted them to the professor. The professor then distributed them in equal numbers to each student on October 7, and the students entered the responses into Excel and then sent the files to him by November 4. During this time, the students took the midterm exam on October 14, which included questions about survey design and interviewing. After receiving the data on November 4, the professor translated the responses into SPSS data format. On November 18 the students received the assignment describing the 2-3 page paper they were expected to write in which they conducted bivariate analysis to describe how a variable they selected correlated with the migrant students' civic knowledge. The paper assignment required a measure of association between the two variables, with a statistical test of the result, to be analyzed by the students. The paper was due on the last class meeting of the regular semester, December 9. The paper assignment is included

as Appendix A.

The random assignment to the treatment condition happened in the first weeks of the semester. Two of the 45 students dropped out of the class over the course of the semester. By the end of the semester, of the remaining 43 students, 22 were in the time stress treatment, and 21 were not. The professor calculated final course grades. For those in the time stress treatment group, part of that course grade consisted of their experiential learning grades. First, students received 10% of their course grade for conducting the interviews at the high schools. Second, they received 10% of the course grade for writing up a description of their analysis of the survey results. Finally, they received 5% of their course grade for writing up a critique of the questions that the professor proposed to administer to the high school students. All of the assignments counted in total as 25% of the course grade.

3.2 Dependent Variables

For the time stress treatment group students, the remaining 75% of their course grades constituted what for the other students was 100% of their course grades. It is the remaining 75%, I analyzed, as the main dependent variable. The first dependent variable I analyzed was the final course grade percent, which for the time stress treatment group students, is the grade after dropping the 25% of the grade for the service learning assignments and then re-weighting the remaining assignments. All students could earn extra credit by attending study sessions outside of class, and so the total course percentage could exceed 100%. There were also extra credit questions on the final exam, and so the same holds for the final exam scores. One would predict that students in the time stress treatment might both attend more extra credit sessions, and also engage in grade balancing with the extra credit. Unfortunately, the extra credit scores and grades are not available for analysis.

I also analyzed the final and midterm exam grades. The midterm exam was composed of typical research design questions, such as asking students to categorize variables by level of measurement, and also to diagnose flaws in survey questions. The final exam included questions on when to decide between bivariate or multivariate analysis, and also, how to interpret bivariate analyses such as cross-tabs and correlations. These were the kinds of analytic methods the service learning students used in their papers. The final also included OLS Regression questions.

There were other course assignments as well. There was an in-class quiz a week before the midterm exam, which measured knowledge of some of the same material as the midterm (although it did not measure any knowledge of survey research). There were very brief on-line quizzes that measured understanding of the in-class lectures. There was an overall homework grade, which was the average of the workbook chapters from the first half of the semester that concerned research design, and then also the statistics exercises from the second half of the semester. Finally, I analyzed the statistic exercise grades themselves.

Of course, no comparisons of the treatment and control groups are valid if random assignment to the two groups did not succeed. In Appendix B, I report statistical tests of whether or not the random assignment may have failed, and all evidence indicates that the random assignment was successful.

4. Results

4.1 Hypothesis 1

The first hypothesis of the analysis is that the experimental and treatment groups should have equal grades. In Table 1, I find that the differences in the grades between the two groups are small, and not statistically significant at the $p<.10$ level, with a two tailed test (Note 1). The table reports all of the t-statistics of the differences, and they are all below 1.0 (and most of them are much lower).

Table 1. No Overall Effects of Time Stress Treatment on Course Grades

Dependent Variable, in Percent	*Time Stress Treatment*	*Control Group*	*Difference*	*t-statistic of difference*
Overall Course Grade: **excluding** service learning assignments	87.4	90.7	-3.3	-0.69
Final Exam	95.7	102.13	-6.43	-0.99
Midterm Exam	83.64	84.48	-0.84	-0.20
In Class Quiz	78.98	77.78	1.20	0.16
On-line Lecture Quiz	80	84.42	-4.42	-0.54
Overall Homework	91.46	92.08	-0.62	-0.10
Statistic Exercises Homework Average	84.35	90.63	-6.28	-0.97
Total cases	22	21	1	n/a

On the one hand, these results can be seen as puzzling. The literature is full of positive reports of experiential learning in research methods classes (see Earley, 2014 for a review). Of course, from the perspective of students as grade satisficing, the result is not puzzling at all. The theoretical argument predicts that students in the course began with some target grades in mind that they sought to achieve, and they set their efforts accordingly. If the random assignment to the treatment was successful, this average expected or desired grade should be the same between the two groups.

4.2 Hypothesis 2

To test the grade balancing hypothesis, I conducted further analyses. The university where the class was held hosts an office to facilitate active learning, and their staff conducted pre- and post-surveys at the very beginning and end of the semester. This paper features some analyses of the survey data. In the pre-survey only, students in the time stress treatment were asked about their participation in a variety of extra-curricular activities. They were asked what types of activities they volunteered for or participated in, and also, how much time they spent doing so.

I found a clear difference in the effects of the treatment that varied by how busy students were with volunteer work. To estimate this difference, I first created an index from the pre-study survey responses, adding together the number of extra-curricular activities that students reported participating in. I then measured the amount of time students reported devoting to these activities by using another question. I weighted the number of types of activities students reported by the amount of time that they reported the activities taking by multiplying the count of types of activities with the reported time commitment. I split the resulting distribution into a high and low group at the median value. The measures of busyness include political and non-political activities. This study took place during the fall 2014 semester, which was an election year in the U.S., and it is common for political science students to be active in political campaigns. I ran separate analyses among the political and non-political volunteers, and found few differences between them. The political volunteers do not appear to be causing the results. Please see Appendix C for further details. I report the results in Table 2.

Table 2. OLS Regression, Time Stress Treatment Effects among Students Who Volunteer at High and Low Time Commitment Levels[a]

Dependent variables	*High Time Commitment*	*Low Time Commitment*
Overall Course Grade Percent:	-16.94*	9.14
excluding service learning	(6.23)	(5.12)
Intercept	98.8**	84.86**
	(4.75)	(3.48)
r^2	0.43	0.22
Final Exam Percent	-26.09**	11.21
	(7.63)	(7.82)
Intercept	113.8**	93.78**
	(5.83)	(5.31)
r^2	0.54	0.16
Midterm Exam Percent	-2.66	0.47
	(6.41)	(83.20)
Intercept	86.27**	83.19**
	(4.89)	(4.28)
r^2	0.02	0.00
In class quiz percent	-9.72	11.11
	(8.91)	(11.37)
Intercept	84.00**	73.33**
	(6.80)	(7.72)
r^2	0.11	0.08
On-line lecture quiz percent	-23.69^	13.55
	(11.83)	(9.58)
Intercept	94.4**	77.29**
	(9.04)	(6.51)
r^2	0.29	0.15
Overall homework percent	-16.57	13.5^
	(9.58)	(7.38)
Intercept	102.00**	85.00**
	(7.32)	(5.02)
r^2	0.23	0.23
Statistic exercises average homework percent	-18.38^	3.90
	(8.73)	(9.11)
Intercept	99.32**	84.43**
	(6.67)	(6.19)
r^2	0.31	0.02
Total cases	21	22

** p<.01; * p<.05; ^p<.10; two tailed tests

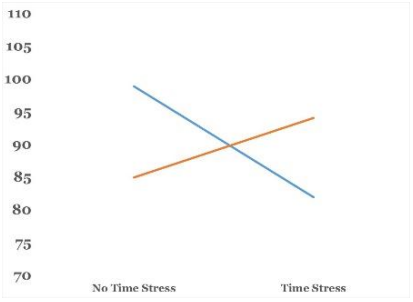
[a] Each coefficient represents the difference in the time stress treatment group, compared to those students in the control group (standard errors in parentheses).

I estimated a series of bivariate regressions, in which each of the dependent variables was analyzed among the two split samples: the high-time commitment sample, and then the low time-commitment one. Each coefficient represents the difference in the dependent variable caused by the assignment to the time stress treatment. One can see that for every dependent variable, the treatment reduced the grades among those with high time commitments, but improved them for those with the low time commitments. These are the population data -- these are the students involved in the project, and so these coefficients represent the "effects" among these groups – inferential statistics are not required. One can also note that the r-squared statistics are generally much higher in the high time commitment group, compared to the low commitment group. For example, in the high time commitment group, the treatment explains more than half of the variance of the final exam grade; while for the low time commitment group, the treatment only explains 16%. Aside from the magnitudes of the coefficients, this is another indication that time stress caused greater changes in behavior among the busier students, compared to the less busy ones.

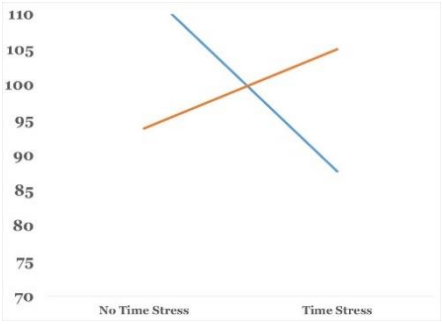
These results are population effects, but if one wishes to take the analysis further, and imagine generalizing the results to the theoretical "super-population" of research methods students at this university, across time, then one should consider the statistical confidence of these results (e.g. Malec, 2008). That is to say, from one perspective, I am analyzing the population data – these students *are* the ones who completed this research methods class at this time and place. However, I wish to generalize the results beyond just these students, to students facing time stresses in general. Such students become the "super-population" I wish to generalize the results to – and I use the inferential statistics as the guide in concluding if one should do so (as such, we would not want to generalize the result from Table 1 to the "super population").

One can see that among the high time commitment students, the negative coefficients are significant, at least at the $p<.10$ level with a two tailed test, in four of the seven models. The results indicate that among the high time commitment students, the service learning project reduced their overall course grade by about 17%. The largest negative impact is on the final exam grade, decreasing it by 26%. In contrast, among the low time commitment students, the positive coefficients are only significant in one of the seven models. The statistically significant result indicates that among the low time commitment students, the service learning project increased their overall homework grades by about 14%.

To demonstrate these interaction effects graphically, I report Figure 1. In this figure I plot the predicted scores for those with high time commitments (the blue line) and those with low time commitments (the orange line). The predicted scores for the two groups in the control condition are plotted on the left, and the time stress condition, on the right. The predicted scores are those generated from the regressions reported in Table 2. The y-axis displays the relevant grades, as percentages, ranging from 70% to 110% (the scores could total above 100% due to extra credit). One can see that in almost all of them, a strong interaction effect is in place: For those with the high time commitments, the time stress treatment lowered their grades, while for those with the low time commitments, the grades increased. The one exception to the pattern is for the midterm exam, for which the time stress treatment made little difference. The strongest interaction effect is for the final exam. Among those in the control group, people in the high time commitment group scored 20% higher than in the low time commitment group. However, in the time stress treatment group, the high time commitment people scored 17.3% lower than those in the low time commitment group.

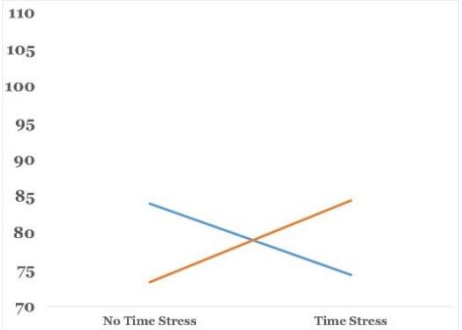


Panel A. Overall Course Grade

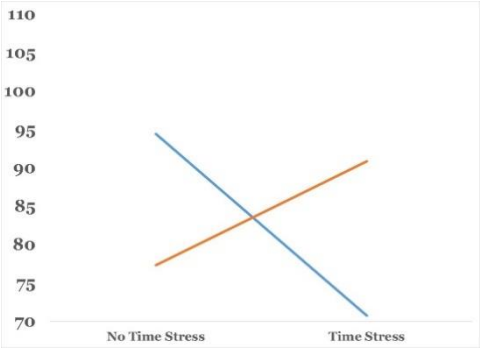


Panel B. Final Exam Percent

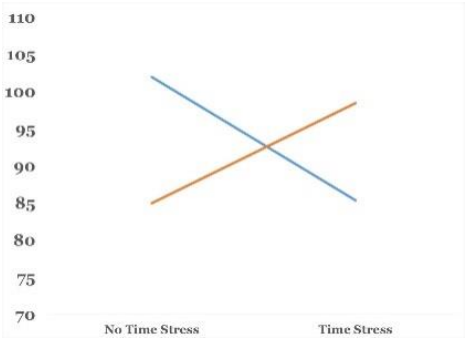
Panel C. Midterm Exam Percent



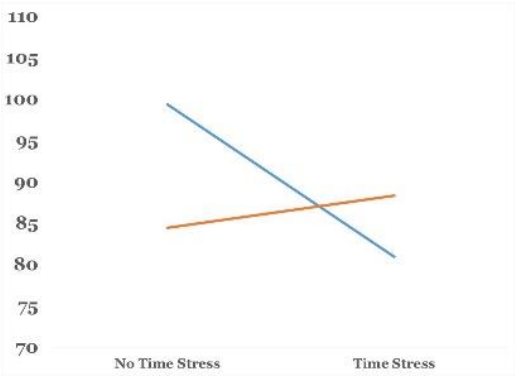
Panel D. In-class quiz percent



Panel E. Lecture quiz percent



Panel F. Homework percent



Panel G. Statistics homework percent

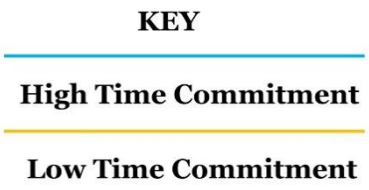


Figure 1. Interactions

The service learning project clearly caused the busier students to have lower grades, but the question remains as to why. One potential unintended effect of the treatment could have been to make the service learning students angry at having to do more work than the other students. The effect of the anger could be to reduce course grades. I do not believe this is what happened. First, for the students in the time stress treatment, their higher service learning assignment grades correlated negatively with their other course grades. The strongest such result is that, students' service learning grades and final exam score correlate at -0.81 (p<0.01 level, two tailed test). Anger would produce an overall negative effect, on all grades (Lopez & Thurman, 1986; Sabee & Wilson, 2005; Kaplan, 2004). Second, neither the professor nor the teaching assistant heard any negative comments regarding the exercises from any students at all (in neither the treatment nor control groups); nor were there any related comments of any kind on the course evaluations. Third, service and experiential learning are a deep part of the culture at the university. According to the university website, in a typical semester, more than half of the undergraduate students take classes requiring such exercises. In fact, the university has won prestigious national awards for its commitment to service learning.

The better explanation is grade satisficing. Students in the treatment knew that 25% of their course grade would be based on the service learning project, and that receiving higher grades on that project would be easier than receiving higher grades on the typical assignments, like the exams.

5. Discussion and Conclusion

5.1 Overview of Results

I employed an experimental design to induce student time stress. The treatment produced mild negative effects on grades among the students in the class. The results were not statistically significant, and so one would not want to generalize the results to the population of research methods students in that class, offered by that department. However, these results are consistent with the view that students act as grade satisficers. When students are under greater time stress, they balance their higher grades on the easier assignments with lower grades on the more difficult ones. Among the *less busy* students in the time stress condition, their overall course

grades increased, while for the students more active in volunteering, their grades decreased. Researchers argue that when students decide how to spend their time, those decisions reflect how they assign utility to different endeavors and outcomes (e.g. Chadi, Pinto & Schultze, 2019). Students who volunteer more also value their educational performance less. This would explain why in the time stress condition, the treatment caused the grades of students who volunteered more to decrease, while the grades of the other students actually increased.

Of course, not only do students who volunteer more seemingly value their education less, but such students actually experience more time stress (Beban and Trueman, 2018). Stress leads to the effects covered in this paper's literature review -- ranging from avoidance (e.g. Beck & Schmidt, 2013), to negative psychological states, such as feelings of depression (e.g. Pascoe, Hetrick & Parker, 2019). Also, experiential learning exercises are meant to increase knowledge, interest, and engagement with the material, thereby increasing learning, and the less-busy students would be the ones in the better position for this to be the case (e.g. Earley, 2014). This may have resulted in a kind of double-effect, in which the time stress led the busier students away from deeper learning, but also led the less busy students to engage in the deeper learning that experiential learning can cause.

Following from this last point, time stress seems to impact so-called, "goal mastery orientation" (Beck & Schmidt, 2013). Students in the U.S. cite many reasons for attending college. While current students are more likely to say that they attend college to secure higher-paying jobs than students did in past decades, even current students frequently refer to the exploration of ideas and acquisition of knowledge as the other main reasons to attend college (Twenge & Donnelly, 2016). However, cognitive psychologists find that this deep learning and mastery of complex skills best occurs in situations of rest and calm. As stress increases, people find it harder to pursue this goal. The findings here are consistent with this pattern of results. Among those assigned into the time stress treatment condition, their higher grades on the easier experiential learning assignments, which were largely graded based on completion, correlated with the final exam grade (which measured their mastery of statistics) at an astounding -0.81 (p<0.01 level, two tailed test).

5.2 Limitations of the Research

The study presented here has strengths, but surely weaknesses as well, which should all be weighed against one another. The great strength of the study is that, for the first time, student time stress was experimentally manipulated. In all other studies of student time stress, the correlation between the time students spend on non-academic activities and their academic achievement is observed. Naturally, these correlations are negative. However, sorting out the causal effect of the time commitments themselves (such as those involved with working at a job) with other confounding factors, such as students' family socioeconomic status, is challenging. In this study, the time stress is the clear operating factor because it is the result of an experimental treatment. We can thus conclude that the time stress did cause the grade balancing. On the flip side, however, the strength of this research design should be balanced against its weaknesses. The study involved a single class of students at a single public university in the Midwest of the United States, in a single semester. Related to that, the class started with 45 students, which then became the sample size for the study. Smaller sample sizes reduce statistical power, which is the probability that one would observe a statistically significant effect in the presence of a true effect (e.g. Cohen 1992). That said, sample size is not an inherent good in and of itself. The analysis demonstrates that there are enough cases to find statistically significant effects of grade balancing (see Table 2).

5.3 How this Study should Inform Educators

As educators, we may hope that our students will be "grade maximizers," and that they will prioritize their course work over other aspects of their lives. After all, as academics, many of us surely did so. Of course, in reality, we recognize that students have a wide variety of competing claims on their time. Most professors surely do not begrudge them that, nor should we. The pre-study survey that the students filled out allowed measurement of one of these claims on their time – the amount they volunteer. Compared to some other ways students spend their time, one hopes that students will volunteer less if their course work requires it. This does not appear to have been the case for the students in this study. More importantly, one can imagine other time constraints which students have even less ability to mitigate. Many students in Western nations work their way through college, and they cannot work less when courses demand more of them. Scholars find that student work commitments have very concrete negative impacts on their academic success (e.g., Sanchez-Gelabert, Figueroa & Elias, 2017). Unfortunately, I did not have measures of work time commitments, but this should not be a threat to the study's conclusions. The random assignment of the treatment means that students worked the same amount in the treatment and control groups. If I had access to work-report data, I could test to see if those time commitments also conditioned the effect of the time stress treatment on the course grades, like the volunteering did. That research question would be a great topic for further study.

Students have fixed time to devote to learning. Students in this study could have reacted to the time stress treatment by reducing their volunteering commitments, but apparently, they did not. They could have reacted by devoting less time to other courses, but again, there is no evidence for this. The busy students diverted time from learning the material in the traditional way (such as studying, it would seem) to devote to the experiential learning project. The causal effect of the time that students devote to course material (such as studying and writing papers), on academic performance, is a well-documented one, with far too many supporting cites than can be included here (e.g. Bandiera, Larcinese, & Rasul, 2015; Krohn & O'Connor, 2005; Löfgren & Ohlsson, 1999; Masui et al., 2014).

The findings in this paper lead to the conclusion that university instructors should be wary when deciding how to apportion final course grades. In this experiment, the time stress treatment was worth 25% of the course grade and involved an assignment requiring students to edit a survey, administer it in a face to face interview format, and analyze the data. Among the students in the time stress treatment, higher grades on the experiential learning assignment correlated quite negatively with the other course grades. If instructors are awarding similar shares of their course grades (i.e. 25%) for other largely participation-based exercises that are not directly linked to learning, then grade satisficing on the scale found here may be relatively common. A review of 17 syllabi from the International Society of Political Psychology website found that the median and mode of the share of course grades counting toward participation was 20%. One professor awarded 50% of the course grade for participation.

There may be other goals that instructors wish to achieve in class, other than learning and skill acquisition. Perhaps inducing class participation in this way builds a collective sense of community (evidence does indicate that when instructors offer course credit for participation, students do participate more; Sommer & Sommer, 2007). As the literature indicates, these kinds of more ephemeral outcomes may not be linked to increased student learning, but instructors are free to design syllabi with a variety of goals in mind. The point is simply that instructors should be cognizant of the trade-off being made, and should think in terms of which kinds of assignments lead directly to student learning, and which may not. Surely, rather than simply abandoning elements of a course that are not clearly linked in the academic literature to student learning, educators can reduce the portion of course credit that counts toward these activities. It is plausible that as the share of the course grade increases that leads directly to learning, opportunities to grade satisfice decrease, boosting learning overall.

Student grade balancing has large effects on student academic performance, and thus, learning. While the study reported here does involve analysis of a relatively small sample, it also demonstrates how grade balancing has powerful effects. Few scholars have studied this topic at all, and even fewer under the explicit rubric of grade satisficing (Hadsell & MacDermott, 2010; Stohs, 2016). This topic of study should receive much more attention from researchers. One main topic could follow from that raised in this study: How do educators maximize student learning, in the face of grade balancing? This study proposes that student assignments more clearly linked to learning should dominate syllabi. However, what are other ways in which student learning can be maximized, given that students engage in grade balancing? Furthermore, how do students decide the grade thresholds which they are satisfied with? This must vary across a wide-range of factors: Demographic, socioeconomic, sociological and psychological. How might environmental factors affect grade balancing – such as aspects of how class is conducted, or relationships among students? The dynamics of grade satisficing and grade balancing is a vast, almost completely unexplored topic of academic study, and the depths of its effects are unplumbed.

Declarations

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Notes

Note 1. The service learning literature would lead to the prediction that the coefficients would tend to be positive, because service learning is meant to increase engagement with course content and lead to greater learning (e.g. Warren 2012). However, the coefficients here are almost all negative. What this suggests is that among this group of students, the randomly assigned service learning assignment did increase time stress, the effect of which was to decrease their grades on almost all of the assignments. However, these negative effects are small to moderate in size. They are also not statistically significant - the interpretation of which we turn to shortly. As Table 2 reports, while the negative direct effects of the time stress on the grades were small, the time stress did lead to a great deal of grade balancing.

Appendix

Appendix A. The Assignment

Service Learning: Brief Results Write-Up

Due date: Tuesday, December 9

As part of the service learning exercise, you have collected the survey responses from the [redacted name of school district] high school students. You then entered those responses into a spreadsheet, and [redacted name of teaching assistant] merged them together into one single spreadsheet. The final step in this service learning assignment is to analyze the association between two of the variables in the data and write a brief summary of what you find. This paper should be two to three pages long. It is due in class on the last meeting of the regular semester: Tuesday, December 9.

Step 1: Begin with the codebook (the list of variables)

Find two variables that you think should be associated with one another. In the paper you should identify those two variables. What is it about those two variables that is interesting to you? How do you expect them to covary - positively or negatively? What does that mean, and why do you expect them to vary such? For example, if you were studying income and voter turnout, you would expect a positive relationship, meaning that people with higher incomes are more likely to vote. And then you would provide a brief argument for why you think it would be so - people with higher incomes tend to have more individual resources with which to make sense of politics. People with higher incomes may have more free time to devote to politics. People with higher incomes may feel they have more at stake in politics because tax policies impact them more.

Also, state which variable you expect to be independent, and which dependent. In the previous example, income is independent, and turnout is dependent. Clearly, people with higher incomes vote more, but voting more does not lead people to have higher incomes.

Step 2: Learn how to use SPSS

In SPSS, you will run a cross-tab in which you show the relationship between the two variables. [Redacted teaching assistant name] will hold sessions in which he explains how to run the cross tab. You will want to be sure to select column percentages so you can see how the percentages of the bivariate (two variable) columns vary with the categories of the rows. You should list the dependent variable in the rows, and the independent in the columns. Estimate a chi-squared statistic as well. This statistic tests to see whether or not the relationship between the two variables is statistically significant.

Step 3: Finish writing it up

Select the cross tab from the SPSS output, copy it, and paste it into your paper. Report the value of the chi-squared statistic, and the p-value. What is the relationship between the independent and dependent variable: What is the direction, and what does that mean, substantively? Is the relationship statistically significant at the

p<.05 level with a two tailed test?

Explain what it means if the result is, or is not, statistically significant. Did the result come out as you expected, or not? If not, speculate as to why.

To conclude, address the broad meaning of your conclusion. What does this result mean or imply for migrant high school students' civic attitudes?

Here is the grading rubric for this essay, in the order you in which you should cover these points in the paper:

Select the cross tab from the SPSS output, copy it, and paste it into your paper.	15%
What is it about those two variables that is interesting to you?	5%
Do you expect them to covary positively or negatively?	5%
What does that mean?	10%
Why do you expect them to vary such?	10%
Which variable is independent, and which dependent?	5%
Report the value of the chi-squared statistic, and the p-value.	5%
What is the direction of the bivariate relationship?	5%
What does that mean, substantively?	10%
Is the relationship statistically significant at the p<.05 level, with a two tailed test?	5%
Explain what it means if the result is, or is not, statistically significant.	10%
Did the result come out as you expected, or not? If not, speculate as to why.	5%
Address the broad meaning of your conclusion.	10%

Appendix B. Randomization Check

Table B1. Randomization Check of Time Stress Treatment, Pre-Study Survey Responses

	Time stress treatment group	*Control group*	*t-statistic of difference*
Percent female	38.5	41.7	-0.20
Years in college	3.10	3.17	-0.17
Percent social science majors	69.2	75.0	-0.20
Count: Dropped the class	1	2	-0.49
Volunteer scale average	10	7.67	1.01
Interest in course work scale average	1.44	1.33	0.68
Previous grade scale average	2.00	2.22	-0.76
Cases	22	21	43

This table finds no statistically significant differences between the treatment group and the control group, at the $p<.10$ level with a two-tailed test. The service learning office at the university administered a pre-study survey to the students, which is the source for the final three tests: The scale measuring how much students volunteered, an item measuring their self-reported interest in their course work, and then a final item in which they report their previous course grades.

Appendix C. Measurement of Student Activity

In item one, students in the time stress treatment were asked if they regularly participated in any of the following activities in their school or community: Sports, student government, community groups, job, school clubs/teams, band/chorus/theater/dance, church activities (worship, youth group), none of these, or some other activity (as an opened ended question).

In item two, they were asked if they had ever volunteered or provided community service: With their family, community youth group, with neighbors/friends, in school (before this year), with a church group, or other (with open-ended response).

Finally, in item three, they were asked how often they had performed the following activities since entering college: Voted; participated in organized demonstrations; performed volunteer work; discussed politics; socialized with someone from another racial or ethnic group; discussed religion/spirituality; worked on a local, state or national political campaign; donated to a public cause; and finally, contacted a public official. The answer categories were: Frequently, occasionally, or not at all.

The student activity scale was created by taking a count from items one and two and multiplying the count by the responses for item three, *but only for working on a political campaign and performing volunteer work*. The other activities measured would typically involve much less of a time commitment. The high and low groups were divided at the median value of the scale.

I report the distribution in Table C1.

Table C1. Frequency Distributions for Student Activity Variables

For each activity, please indicate how often you have done it since entering college.

	Political		Non-Political	
	Protest	*Campaign*	*Contact*	*Volunteer work*
Frequently	0	1	2	3
Occasionally	5	7	7	13
Not at all	18	15	14	7
Total cases	23	23	23	23

Only asked among students in the time stress treatment