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Treating students like adults - can they manage their own grading scheme?

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Abstract

This is a preliminary study where it is proposed that giving the students the opportunity to manage their own grading scheme can help with their learning. Conventionally, each instructor creates a grading scheme for their class, assigning certain percentages to each type of assessment they use. Each class has different types of assessment, which can include homework assignments, quizzes, mid-term exams, final exams, projects, and attendance / participation. An instructor may choose to eliminate some of these whereas using and prioritizing others based on class content. However, what is usually not considered is the lack of understanding and consideration of student psychology and characteristics that is associated with standardized assessments. Test anxiety is a known issue, and it is particularly salient with minorities. Similarly, it was also shown that specific minority groups have lower turnout rate with homework submission. Therefore, allowing the students to modify their grading scheme can improve their overall grade in class. In addition, letting the students have more control on their assessment can improve their self-respect and confidence in their capabilities, eventually increasing their determination towards succeeding in the class and college experience as a whole, as described by the self-determination theory and its effects on self-motivation. The main disadvantages of giving students control of their grade are (1) they may not have a correct self-assessment of their abilities, (2) grading and assigning letter grades at the end of the semester becomes an increased load for the instructor, particularly in larger classroom sizes, and (3) students can be inclined towards changing their grading scheme too much and ultimately undermining the purpose of some assessment types. In this preliminary study, a graduate-level class (17 students) was selected for implementation of the method, and the effectiveness of the method was assessed by comparing the performance of students who modified the default grading scheme based on their preferences. After analyzing the preliminary results, methods of overcoming the three major challenges of giving students control over their grade are presented.

Introduction

Although standardization has many advantages, it is usually seen as the enemy of innovation. In fact, Acemoglu and colleagues said that[1] “standardization is both an engine of growth and a potential barrier to it.” This was said in the context of production and economics, but is believed to apply to standardization in education as well. For example, standardized tests have been used in assessing level of understanding for a long time. With increasing population, use of standardized methods to evaluate and compare candidates for any task or title is an inevitable solution. However, there are many problems associated with standardized testing[2]. Among other issues, standardized tests have been shown to be biased against minorities and students from less privileged backgrounds[2]. Innovative techniques in assessing student learning has been developed over the last few decades. Another example where innovative techniques are required is the standardized assessment of students, where currently their personal traits and qualities are not

weighed in when determining how their assessments are to be used to assign final grades. In virtually all classes, all students are provided with the same grading scheme that is relevant to the type of class. In some classes, homework assignments are considered to be more conducive to learning. In other classes, fixed-timed examinations, open- or closed-book style, can be preferred. Many modern classes use projects and hands-on experiences or case studies to address "learn by doing" students. Attendance and/or participation is commonly a part of the grading scheme. Other less common methods of assessing student learning and work can be observed as well. Whatever the method, almost always, all students taking the class are subjected to the same standards when it comes to assessing their progress. For similar reasons to other times when standardization hinders innovation, standardized assessment weights do not account for differences between students but rather assumes and equates each student to an estimated average student. Innovative methods are needed to be able to evaluate each student separately.

In this manner, the audience of this work is challenged to consider a hypothetical situation where the Earth is invaded by aliens and they decide to find the best 1% of human beings without any purpose. Would everyone agree that the fastest people in a mile-long run would be the best human beings? That would be analogous to subjecting students to a single test that would determine their whole letter grade from a class. An alternative would be to ask everyone to do the following tasks: mile-long run, tap dance, solve some mathematical questions, gather specific types of herbs, and cook a certain meal. Almost surely, there would be people who can ace all five tasks, but would everyone be in agreement that the aliens are testing us in a fair way? This type of testing would be analogous to what has been used widely in our education system. An alternative would be to give a choice to each person being tested about how they want to be assessed. Someone who is a great golfer may not want to be tested for their running speed, but it does not mean that they are bad at every craft they are involved in. Similarly, students should be given the opportunity to select their way of assessment. In this study, how that can be accomplished is discussed.

Many scholars studied the grading practices from different perspectives. For example, researchers found that many local school districts have grading policies in effect, which included grading system considerations for students with disabilities[3]. Docan (2006) observed that there was a difference in offering positive and negative incentives as part of the students' grades and had different effects on their motivation throughout the semester[4]. A big portion of discussion of grading percentages also revolves around participation, which is considered to be not a part of students' learning therefore should not be included in their final grade[5]. Brubaker (2010) was the one who did a study that was similar to what has been discussed in this work[6]. In their study, they considered giving more autonomy to the students as "negotiating authority" in classroom. In their study, instead of providing maximum autonomy to students in choosing their grading scheme, they negotiated with the students to arrive at a mutually-agreed decision. In their study, students were also allowed to have more options in terms of what they can be assessed on rather than the percentage of each assessment type that was pre-determined for them. Although their study has more freedom from some perspectives, it still presumes the common notion that the teacher has to be the authority in the classroom by attaching a negotiation string to students'

freedom to choose. In this study, that notion is challenged by voluntarily releasing all authority on student grading scheme and putting the choice almost completely in their hands.

Student psychology is interesting in nature, but is extremely undervalued. This is disappointing to observe in the modern world as every teacher has at one time in their lives been a student. Still, a non-negligible portion of them do not consider student psychology and how it can affect student learning. Without such considerations, education cannot be effective and the whole education system cannot function efficiently. Standardized assessments do not consider student psychology or personal traits. For example, students frequently report test anxiety, which means they do not perform as well as they could have done in another setting[7]. This was found to be particularly the case with minority groups[8]. Another example can be homework submission, which requires an organized personality to adhere to deadlines and following the class properly in a daily manner. Some students tend to be great with homework submission - there is almost always a student in any class who submits all homework assignments within a short timeframe after they are assigned. However, some students can be on the other side of the spectrum, where they fail to recognize that homework assignments are conducive to their learning. In this study, students were given the opportunity to choose which type of assessment is more suitable to their personalities and characteristics. Regardless of which assessment they might prefer, by providing students the capability and freedom to choose, it was aimed that they would feel more motivated and mentally strong, which in turn encourages them to excel in their chosen field of study, college, and life in general. This theory was based on the self-determination theory, which states that the need for autonomy is one of the three factors that improve self-motivation and well-being[9]. It was targeted in this study that giving more autonomy to the students would boost their final grades, as well as their self-respect and confidence in their capabilities as they are trusted with a decision that they are not commonly trusted with. Potentially, this can increase their determination to succeed in their education.

Methodology

In this preliminary study, a graduate-level class of 17 students was taken as the group to study. Since the implementation of the method requires strong decision-making skills that are attained with experience, particularly slightly more mature students were used. This is the reason why the method was implemented on a graduate-level class rather than a lower-level class for the preliminary study. Once sufficient confidence is achieved, the method should be applied on lower-level classes as well. When method was to be implemented, all students were presented with the opportunity to choose between building their own grading scheme and keeping the grading scheme that was prepared for them by the instructor. This was particularly done in the first class where students are used to receiving the syllabus and reading the grading scheme that is prepared for them. Students were told that by the start of the second class, they have to let the instructor know via email if they would like to change their grading scheme. If not contacted, the instructor would assume they are keeping the original scheme. Many students (7 out of 17) opted to keep the original grading scheme for many reasons they have voiced in addition to reasons they potentially did not declare. Reasons they shared with the instructor included trusting the

instructor's judgement, feeling anxious and not confident in changing their assessment since they are not used to doing it, and not having sufficient information about assessment types. The instructor made sure that all students had the chance to evaluate their options, through frequent reminders via email and in class. The majority of the class (10 out of 17) chose to alter the original grading scheme presented to them in some way. Reasons they shared with the instructor included text anxiety and not trusting themselves with timely submission of homework assignments.

In the original grading scheme, it was intentionally determined to include many different types of assessment so that students had maximum freedom to choose from a pool of assessment types: 9% for homework assignments (ten assignments in total, lowest one dropped, one assignment each week there is not an exam), 16% in total for four quizzes spread throughout the semester, 20% in total for two mid-term exams, 25% for a final exam, 20% for a term project, and 10% for attendance and participation. Although formal attendance was not taken, patterns of not attending or late attendance were noted for inclusion in the 10%. Students were told to modify the grading scheme as they see fit to their individual characteristics and preferences, adhering only to three rules set for them: 1) 10% for attendance and participation is fixed and cannot be changed, 2) total of final culminating experience assessment types (final exam and term project) has to be at least 20%, and 3) lowest grade on homework assignments would be dropped. Otherwise, students were given full freedom. Some examples of the most drastic changes included increasing the homework grading to 50% or dropping the homework grading altogether, reducing quiz percentage to 4% in total, reducing the midterm percentage to 10% total or increasing midterm percentage to 30% in total, dropping the final exam percentage altogether, and changing the project grade to as low as 5% or as high as 40%. All of these requests were accepted respectfully, considering the fact that they adhered to the rules.

At the end of the semester, each student's final grade was calculated using the original grading scheme, as well as their modified grading scheme if they have done any modifications. Two preliminary comparisons were determined to make sense in understanding the effectiveness of the method. The first would be to compare final grades of the students who made modifications to their hypothetical grades in case they had not made any changes. In this comparison, three students (out of the ten students who made grading scheme modifications) who decided to drop an assessment method completely (two chose to drop the final exam and one chose to drop homework assignments) were treated slightly differently to level their results with the rest. Since they decided to drop a certain type of assessment completely, they did not complete that type of assessment. Therefore, judging their grades based on the original grading scheme would show a significant bias towards their chosen method since they would not receive any credit for the assessment type dropped. Hence, their hypothetical grade based on the original grading scheme was calculated assuming the assignment they dropped did not exist and by normalizing their remaining grade. For example, if a student dropped the final exam, their hypothetical grade based on the original grade would be out of 75% (taking out the 25% for the final exam). Therefore, their final hypothetical grade would be normalized to 100% by multiplying the total with 100 and dividing by 75.

The second preliminary comparison made was to compare the final grade of the students who made modifications to the students who did not make any modifications. Since there were only seven and ten students in the two groups, little data exists to back up this comparison. However, it was decided that the preliminary results might show a trend in any direction for future studies.

Results

In Figure 1, results of the class are shown in terms of final grades of all 17 students. Group 1 consists of the seven students who decided to not do any modification to the original grading scheme. Group 2 consists of the ten students who decided to modify the original grading scheme based on their preferences. Group 3 is the same set of students as group 2; however, it represents the hypothetical grades of those students had they not made any changes to their grading scheme.

First comparison is between group 1 and group 2. Here, there is no manipulation to a single group but the effect of the change of one condition is sought after. Therefore, a two-sampled t-test is used to measure the effect of the method. When the test is conducted, it is observed that the null hypothesis could not be rejected at 5% level, since the p-value was $p = 0.0622$. However, since $p < 0.1$was observed, a certain trend can be implied, which is supported by the difference in the averages of the two samples (79 and 87 for groups 1 and 2, respectively). Main reason for the p-value to be not low enough to reject the null hypothesis was that sample sizes for both samples were very low. This is due to the preliminary nature of this study. When further studies are conducted, it is highly probable that a more significant effect of the use of the grading scheme will be observed.

Second comparison is between groups 2 and 3. Here, a manipulation to a single group is sought after, which is the use of grading scheme or lack thereof on the grades of the same group of students. Therefore, a paired t-test is used to measure the effect of the manipulation. As a result, it is observed that there is a significant effect of modifying the grading scheme, evident by the p-value of the paired t-test at $p = 0.0295$. With such a small number of students participating in the study, achieving significance is an important indication that students modifying their grading scheme was beneficial for them, supported by the increase in their average final grades (from 85 to 87 when changed from unmodified to modified grading scheme).

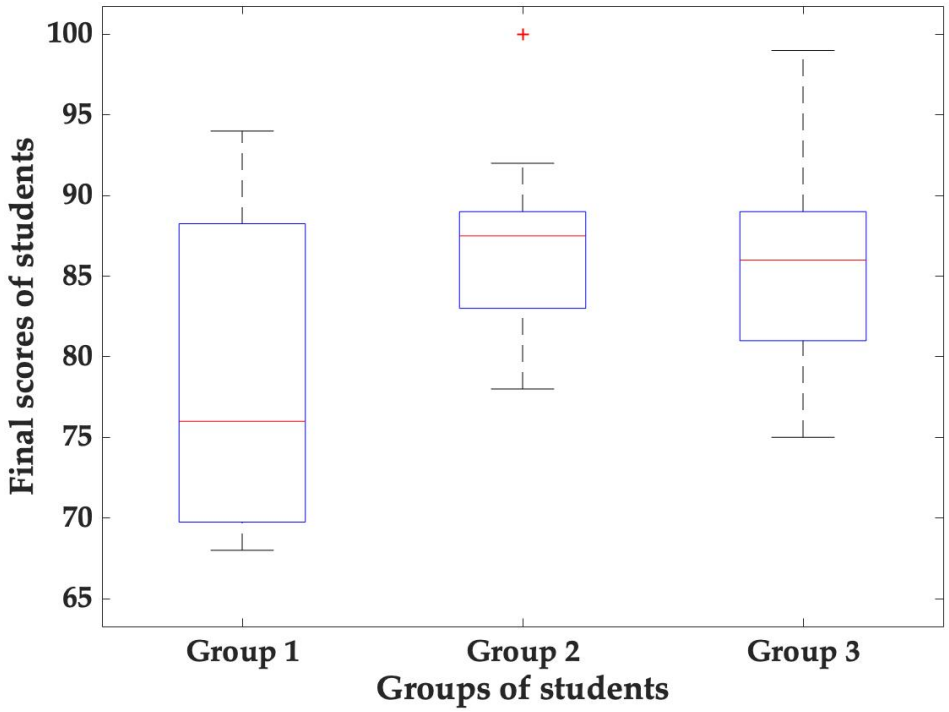

Figure 1: Box plots showing students grade in (i) Group 1: students who did not make modifications to their grading scheme, (ii) Group 2: students who made modifications to their grading scheme, and (iii) Group 3: Hypothetical grades of students in group 2 had they not made any modifications to their grading scheme.

Discussions

In this preliminary study, a new methodology to give the control of their own grading scheme to the students is introduced and discussed. It was shown that the freedom given to the students to choose their grading scheme actually helped improve their average grade. Although two of the students who chose to modify their grading scheme ended up totaling a lower final grade than they would have if they kept the original grading scheme (1% less each, and no letter-grade difference), on average, students were able to improve their grades.

There are three major issues with this method. First major issue is that college students are usually in their late teens or early 20's. At that age, students should not be expected to have a full and correct self-assessment of their abilities. They may think that they are bad at exams, but they may not be completely correct in that interpretation. Sometimes, it may be relatively easy for the instructor to intervene with any student decision to modify their grading scheme in a non-favorable way, but this is only possible if the instructor has already established a relationship with the student. This is particularly difficult in larger classes, but even not very realistic in smaller class sizes. Therefore, students may not be able to find the right counsel to decide. In such cases, students should be directed to use a generic grading scheme instead of creating their own. Unfortunately, no other remedy could be identified during this study. With eight out of ten students improving or at least matching their hypothetical grades had they not requested a

grading scheme change, and the remaining two students only losing a single percent of their grade in that comparison, it can be said that with some counseling from the instructor, students can overcome this hurdle with minimal costs and maximum benefits.

Second major issue surrounding this method is the load for the instructor. Particularly with larger classroom sizes, grading each student can be a long task. If everyone is subjected to the same grading scheme, at least adding up everyone's percentages becomes a rather easy job, especially if technology is used to calculate final grades. However, if every student might come up with a different grading scheme, assigning final and letter grades to each student becomes another big task for the instructor. This study was conducted in a class size of 17, which made things relatively simple in this matter. With bigger class sizes, it can be suggested to delegate the work to teaching assistants, or even better, other students. So, let's assume a class size of 200. At the end of the semester, if each student is asked to calculate the final grade of five of their classmates (in a double-blind manner to ensure anonymity), the tedious task would be delegated to many other people, and with five different reports, risk of miscalculations would be minimized. For example, imagine that the class list is completely randomized, and everyone is given a line number. Without knowing anyone else's line number, if each student evaluates five lines after their own, sufficient anonymity would be provided. Instead of one person calculating 200 grades, 200 people would be calculating five grades each, which would reduce the possibility of mistakes and the load on the one person at the same time.

Third and final major issue with the method is the students who might alter the grading scheme too much. For this issue, let's consider the rules of this study: 10% remains on attendance and participation and 20% is the minimum for the total of final exam and term project. The aim was to put as few limitations as possible to enable maximum amount of autonomy. Therefore, theoretically, any student could set their homework grade at 70% and drop everything that they can except for final experience (20%) and attendance and participation (10%). Since this is not against the rules, they would not be rejected. However, they would be undermining the purpose of the study. If you can assess students only through a few small homework assignments, that is not necessarily fair to each student. This is where quality of assessments play a role. Many instructors do not put enough attention and care into preparing their homework assignments. However, homework is a very important tool to repeat and retain the information obtained in class. If homework assignments are too easy, it defeats the purpose. If they are too difficult, students cannot do them, and the purpose is defeated yet again. Therefore, it is important to set the level of difficulty to an optimal level, similar to the level of difficulty of the exams. Hence, the average grade on homework assignments should be similar to the average grade in exams, which should be similar to the average grade in projects, and so on. If the average grade on each assignment type is similar to one another, students "playing" the system will not be able to gain any unfair advantage. Therefore, once again it falls on the shoulders of the instructor to create better assignments that measure the level of learning effectively and fairly. However, this should be the target for each instructor even without this reasoning, so it is not necessarily an extra load for the instructor. Each instructor needs to find the assessment types and percentages that are not negotiable based on the requirements of the specific course. However, they should keep in mind

that the fewer the limitations, the better this suggested method would work in improving students' self-motivation through increased autonomy.

Conclusions & Future Directions

In this preliminary study, effect of providing students with the option to modify their grading scheme was discussed. Since the study was completed in a graduate-level class of 17 students only, the results are more indicatory than conclusive. However, future studies are encouraged for similar implementations and interpretations of the method to be able to understand with greater certainty the value of this freedom to choose. Even with the preliminary nature of this study, there is a strong indication that students can improve their grades if they are provided with such freedom. A future direction from this work should be to study the effects on students based on their minority status (race, gender, nationality) and find out if there is further indication that such a freedom can be beneficial to minorities that suffer the most from issues such as text anxiety and lower homework submission rates. Students participating in these studies should also be surveyed to observe their self-assessment and perception regarding the study. They should be asked questions that gauge their self-respect and confidence in their abilities before and after the semester to see if there was a boost that is correlated with the freedom to choose. They should also be asked questions regarding their rationale for modifying their grading scheme and observe if there is a relationship between self-reported rationale (such as text anxiety, homework submission, etc.) and their actual modifications to the grading scheme. Finally, a longer study on understanding if their choices made them more self-confident in ways that made them more determined to complete their studies, measured by graduation levels, years to graduate, and self-reports on their perception towards the department, institution, and the major would be needed to measure the level of effectiveness of the method.

Bibliography

[1] D. Acemoglu, G. Garcia, F. Zilibotti. 2012. "Competing engines of growth: innovation and standardization." *Journal of Economic Theory, 147*(2), 570-601.

[2] A. Kohn. 2000. "Standardized testing and its victims." *Education Week, 20*(4), 46-47.

[3] E. A. Polloway, M. H. Epstein, W. D. Bursuck, T. W. Roderique, J. L. McConeghy, M. Jayanthi. 1994. "Classroom grading: a national survey of policies." *Remedial and Special Education, 15*(3), 162-170.

[4] T. N. Docan. 2006. "Positive and negative incentives in the classroom: an analysis of grading systems and student motivation." *Journal of Scholarship of Teaching and Learning, 6*(2), 21-40.

[5] J. C. Bean, D. Peterson. 1998. "Grading classroom participation." *New Directions for Teaching and Learning, 74*, 33-40.

[6] N. D. Brubaker. 2010. "Negotiating authority by designing individualized grading contracts." *Studying Teacher Education, 6*(3), 257-267.

[7] R. Hembree. 1988. “Correlates, causes, effects, and treatment of test anxiety.” *Review of Educational Research, 58*(1), 47-77.

[8] J. W. Osborne. 2001. “Testing stereotype threat: Does anxiety explain race and sex differences in achievement?.” *Contemporary Educational Psychology, 26*(3), 291-310.

[9] R. M. Ryan, E. L. Deci. 2000. “Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being.” *American Psychologist, 55*(1), 68-78.