Getting High School Students Ready for College: A Quantitative Study of Standards-Based Grading Practices

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Some high schools are moving towards standards-based grading in an attempt to produce consistent grading practices; however, the change's impact on college readiness is not clear. The purpose of this study was to explore the effect of high school's grading practices as it relates to ACT scores and grade point averages (GPAs). Existing data were collected from two comparable high schools using different grading practices in a Midwestern state as determined by state department of education-provided demographics: enrollment, socioeconomic status (as defined by percentage of students receiving free or reduced lunch), and ethnicity. Stepwise multiple linear regressions were used to determine if GPA and the method of high school grading practices, standards-based grading or traditional grading, used predict ACT scores. The findings revealed GPAs remain unchanged and ACT scores may be negatively impacted when high schools utilize standards-based grading practices. In addition, traditional grading practices were a small factor combined with GPA in predicting ACT scores.

Keywords: *grading, standards-based grading, college admissions exams, high school*

Educational scholars agree grading is a highly subjective aspect of public schooling and has been for over 100 years (Allen, 2005; Brimi, 2011; Cureton, 1971; Schinske & Tanner, 2014; Schneider & Hutt, 2013; Starch & Elliott, 1912). Jeffrey Erickson (2010) calls grading the "third rail" of education due to the long held beliefs permeating classrooms across the country. The currency required for a student earning an "A" in one high school science class may be equivalent to a "B" in a classroom down the hall. While one teacher may award participation points and extra credit for bringing white board markers to class, another does not count homework towards the final grade and only factors in test and quiz scores. As such, high school teachers and administrators are left unsure of the nexus between classroom grading practices and standardized assessments such as college entrance exam scores.

Meanwhile, some high schools are moving towards standards-based grading in an attempt to produce consistent grading practices (Peters & Buckmiller, 2014; Pollio & Hochbein, 2015; Townsley, 2013). Susan Brookhart (2011) describes standards-based grading as a system designed to communicate how well students have *learned* the standards. This is in comparison to traditional grading which often captures what students have *earned* through homework completion, extra credit, and effort/participation points. This creates a dilemma regarding what a student earns versus what a student learns in high school, which is typically depicted in standardized test scores and grade point averages (GPAs). Standardized test scores are then used, in conjunction with GPA, as a measure of college readiness (Atkinson & Geiser, 2009) thus begging the question of how standards-based grading affects GAP and standardized test scores, which is a very real concern of parents, leading some to transfer their students to schools with traditional grading practices (Dexter, 2015).

While a growing number of studies on standards-based grading have been written during the past several years, many of them have focused on qualitative research questions (e.g., Peters & Buckmiller, 2014; Tierney, Simon, & Charland, 2011). High school educators are left advocating for standards-based grading practices by pointing to theoretical articles (e.g., Bostic, 2012; Iamarino, 2014) or practitioner articles (e.g., Erickson, 2010; Imperial, 2012; Scriffiny, 2008; Townsley, 2013; Wilcox, 2011) and in turn lacking much, if any at all, quantitative evidence evaluating the effectiveness of standards based grading on GPA and standardized test scores. This research fills a gap in the literature by looking at the relationship between ACT scores in a high school using standards-based grading practices and ACT scores in a high school with traditional grading practices. Hence, the purpose of this study was to gain an understanding on the effect of high school's grading practices, whether standards-based grading or traditional grading, on ACT scores and GPA.

Literature Review

Due to the increase in state standards and accountability measures, schools are considering standards-based grading as a means for communicating student learning relative to the standards (Spencer, 2012). Although there are nuances in implementation (Marzano & Heflebower, 2011; Peters & Buckmiller, 2014), authors converge in agreement that standards-based grading is a philosophy of grading and reporting students' academic learning. This is separate from behaviors in which practice assignments do not count towards the final grade, and students are provided multiple opportunities to demonstrate their learning over time (O'Connor, 2002; Peters & Buckmiller, 2014; Scriffiny, 2008; Tierney et al., 2011; Wilcox, 2011). Rather than awarding points for a combination of participation, worksheet completion, quiz performance, three-ring binder organization, and paper writing, standards-based grading

separates academics from behaviors and communicates students' relative strengths and weaknesses relative to mastery of course or grade-level standards uniformly through the grade book. Figure 1 compares a traditional grade book with a standards-based grade book.

Traditional Grade Book	
Assignment	*Score*
Worksheet 5.5	5/10
Worksheet 5.6	9/10
Quiz 5	20/24
Chapter 5 Test	86/100
Kleenex Extra Credit	3/0

Standards-Based Grade Book	
Standard	*Score*
Area of Circle	4/4
Area of Triangle	4/4
Area of Octagon	3/4
Area of Hexagon	2/4
Area of Rectangle	4/4
Key: 1 = Minimal understanding 2 = Partial understanding 3 = Getting close! 4 = You got it!	

Figure 1.

Sample traditional grade book and standards-based grade book

This study was grounded in mastery learning, a theory describing a framework of teaching and learning in which all students *can* learn at high levels (Block & Burns, 1976; Bloom, 1973). When instruction and time are held constant, not all students are likely to learn. On the contrary, students in standards-based grading classrooms are permitted and encouraged to re-assess individually until mastery even when peers have already demonstrated understanding (Scriffiny, 2008).

Although this practice is most widely used in elementary settings, standards-based grading has been utilized in secondary classrooms too, in an attempt to better align with the current K-12 standards-based education and accountability era (e.g., Bostic, 2012; Cox, 2011;

Jones Miller, 2012; Wilcox, 2011). Table 1 compares components of traditional grading with components of standards-based grading practices. Parents of high school students have many questions about the impact of standards-based grading on college acceptance and scholarships (Dexter, 2015).

Table 1.

Comparison of Traditional Grading and Standards-Based Grading Adapted from O'Connor (2002).

Traditional Grading	Standards-Based Grading
1. Based on assessment methods (quizzes, tests, homework, projects, etc.). One grade/entry is given per assessment.	1. Based on learning goals and performance standards. One grade/entry is given per learning goal.
2. Assessments are based on a percentage system. Criteria for success may be unclear.	2. Standards are criterion or proficiency-based. Criteria and targets are made available to students ahead of time.
3. Use an uncertain mix of assessment, achievement, effort, and behavior to determine the final grade. May use late penalties and extra credit.	3. Measures achievement only OR separates achievement from effort/behavior. No penalties or extra credit given.
4. Everything goes in the grade book – regardless of purpose.	4. Selected assessments (tests, quizzes, projects, etc.) are used for grading purposes.
5. Include every score, regardless of when it was collected. Assessments record the average – not the best – work.	5. Emphasize the most recent evidence of learning when grading.

If standards-based grading is making its way into high schools, how does this affect students' preparation for higher education? While a growing number of standards-based grading studies have been written during the past several years, many of them have focused on qualitative research questions (e.g., Peters & Buckmiller, 2014; Tierney et al., 2011). Classroom teachers are left advocating for standards-based grading practices lacking much, if any at all, quantitative evidence.

The impact of standards-based grading on external achievement measures is mixed. While some studies indicate a significant statistical difference in one or more content areas (e.g., Haptonstall, 2010; Pollio & Hochbein, 2015), others have not (e.g., Rosales, 2013; Welsh, D'Agostino, & Kaniskan, 2013). As such, further quantitative studies exploring the impact of standards-based grading are needed. Meanwhile, high school and district administrators are tasked with convincing confused school boards and parent groups (Dexter, 2015) of the benefits of standards-based grading using results from primarily qualitative research questions and very few studies, regardless of methodology, extending beyond K-12.

Some research suggests ACT scores are a valid predictor of post-secondary success as measured by first and second year college GPA (Bettinger, Evans, & Pope, 2013; Pettijohn, 1995; Westrick, Le, Robbins, Radunzel, & Schmidt, 2015). This study will determine the extent, if any, to which standards-based grading practices predict students' post-secondary readiness as measured by college entrance exams such as the ACT.

Method

This study employed a quasi-experimental research design using pre-existing groups consisting of students enrolled in two comparable Midwestern high schools. Existing data provided by these high schools were used to examine the extent to which the relationship

between GPA and ACT scores differ in schools using standards-based grading practices and schools using traditional grading practices. Additionally, this study attempted to determine whether either or both GPA and ACT scores differ based on the grading practices of the high school. Furthermore, this study sought to determine if GPAs and the method of high school grading practices used predicts ACT scores.

Data Collection Procedures

Existing data were collected from two comparable high schools in a Midwestern state as determined by demographics provided by the state department of education: enrollment, socioeconomic status (as defined by percentage of students receiving free or reduced lunch), and ethnicity. Both high schools enrolled between approximately 450 students with less than 15% free or reduced lunch and single digit percentage ethnic diversity. One of the high schools uses standards-based grading practices and one uses traditional grading practices, as confirmed by each school superintendent. The school using standards-based grading practices phased in the change over a two-year time period. During this time period, teachers were provided a full year of professional learning and weekly release time for collaboration. Furthermore, the standards-based grading high school has been featured in two educational magazines during the past three years for its innovative grading practices, and attracts nearly one hundred visitors from area schools each year. The researcher received data on a total of 327 students spread across the two high schools, two graduating cohorts per school. For each student in the graduating classes of 2015 and 2016, participating schools were asked to provide: grade level, gender, cumulative GPA, grade for each math course completed in each reporting period, grade for each English course completed in each reporting period, ACT composite score, ACT math subtest score, and ACT English subtest score.

Research Questions

The research questions for this study were as follows: Is there a difference between high school GPAs that are calculated by traditional grading compared to standards-based grading? Is there a difference between ACT scores among students who are graded by traditional grading compared to standards-based grading? Do GPA and the method of high school grading practices used predict ACT scores?

Data Analysis

To determine the proper analysis, a Shapiro-Wilk test for normality was performed and found to be statistically significant for the first research question. This demonstrated the need to use a nonparametric test for the comparison of the school types. Data were analyzed using Mann-Whitney U tests to answer research question one. Independent sample t-tests were used to answer research question two. Finally, a stepwise multiple linear regression was utilized to answer the third research question. The independent variables were gender; GPA, an interval measurement type; and school type, standards-based or traditional, a dichotomous variable. The dependent variable was ACT scores, an interval measurement type. In addition, a multiple linear regression must include a continuous dependent variable (Huck, 2011), which in this study included school grading practices and GPA.

Results

In the following paragraphs, the results of each research question will be described. Data were analyzed to determine differences between GPAs and ACT scores among schools with different grading practices. In addition, grading practices and GPAs were considered as variables predicting ACT scores.

Grade Point Averages

To answer research question one, a Mann-Whitney U test was conducted to analyze the difference between GPA and grading practices. Math GPAs were not statistically significant (z=-.262, p=.793, r_g = 0.01) between traditional grading (*Mean Rank = 162.11*) and standards-based grading (*Mean Rank = 164.84*), suggesting that students in schools with different grading practices do not have different math GPAs. English GPAs were not statistically significant between traditional grading (*Mean Rank = 161.14*) and standards-based grading (*Mean Rank = 165.77*), z=-.443, p=.658, r_g = 0.02, suggesting that students in high schools with different grading practices do not have different English GPAs. Cumulative GPAs were not statistically significant between traditional grading (*Mean Rank = 162.28*) and standards-based grading (*Mean Rank = 164.68*), z=-.230, p=.818, r_g = 0.00, suggesting that students in schools with differing grading practices do not have different cumulative GPAs.

ACT Scores

To answer research question two, an independent t-test was used to analyze the difference between ACT scores and grading practices. There was a statistically significant difference in mean math ACT score between traditional grading and standards-based grading, with traditional grading students scoring higher than standards-based grading students, 2.265 (95% CI, 1.217 to 3.312), $t(324) = 4.252$, $p < .000$. These results suggest that high school students with traditional grades receive higher math ACT scores compared to students with standards-based grades. Next, there was a statistically significant difference in mean English ACT score between traditional grading and standards-based grading, with traditional grading students scoring higher than standards-based grading students, 2.726 (95% CI, 1.496 to 3.956), $t(324) = 4.359$, $p < .000$. These results suggest that high school students with traditional grades receive higher English

ACT scores compared to students with standards-based grades. There was a statistically significant difference in mean composite ACT score between traditional grading and standards-based grading, with traditional grading students scoring higher than standards-based grading students, 2.227 (95% CI, 1.244 to 3.211), $t(324) = 4.454$, $p < .000$. Finally, these results suggest that high school students with traditional grades receive higher composite ACT scores compared to students with standards-based grades.

Predicting ACT Scores

To analyze the final research question, a multiple linear regression was performed to predict the effect of grading practices on ACT scores (see Table 2). In response to this research question, math GPA is the independent variable with the highest predictive value of math ACT score. The results from the third regression model suggest that an increase in one standardized math grade point is associated with an increase in 3.277 math ACT score points. The results from model three also suggest that males score 2.641 math ACT points higher than females when all other variables are held constant. Finally, the results from the third model suggest that students in traditional grading schools score 2.019 math ACT points higher than standards-based grading students when all other variables are held constant.

Table 2.

Summary of Multiple Regression Analysis for Math ACT

Model	Variable	*B*	SE_B	β
1	Constant	23.611	.223	
	Math GPA (Z)	2.923	.226	.586*
2	Constant	19.479	.686	
	Math GPA (Z)	3.304	.221	.662*
	Gender	2.773	.438	.281*
3	Constant	20.708	.707	
	Math GPA (Z)	3.277	.214	.657*
	Gender	2.641	.423	.268*
	School Type (Grading)	-2.019	.407	-.205*

Note. *$p < .05$; *B* = unstandardized regression coefficient; SE_B = Standard error of the coefficient; β = standardized coefficient

English GPA is the independent variable with the highest predictive value of English ACT scores (see Table 3). The results from the third regression model suggest that an increase in one standardized English grade point is associated with an increase in 4.007 English ACT score points. The results from model three also suggest that males score 1.015 English ACT points higher than females when all other variables are held constant. Finally, the results from the third model suggest that students in traditional grading schools score 2.654 English ACT points higher than standards-based grading students when all other variables are held constant.

Table 3.

Summary of Multiple Regression Analysis for English ACT

Model	Variable	*B*	SE_B	β
1	Constant	24.514	.244	
	English GPA (Z)	3.792	.245	.652*
2	Constant	25.899	.333	
	English GPA (Z)	3.792	.234	.652*
	School Type (Grading)	-2.713	.466	-.234*
	Constant			
3		24.354	.848	
	English GPA (Z)	4.007	.257	.689*
	School Type (Grading)	-2.654	.465	-.229*
	Gender	1.015	.513	.088*

Note. *p < .05; *B* = unstandardized regression coefficient; SE_B = Standard error of the coefficient; β = standardized coefficient

Finally, cumulative GPA is the independent variable with the highest predictive value of composite ACT score (see Table 4). The results from model three suggest that an increase in one standardized grade point is associated with an increase in 3.393 composite ACT score points. The results from model three also suggest that males score 1.626 composite ACT points higher than females when all other variables are held constant. Finally, the results from the third model suggest that students in traditional grading schools score 1.989 composite ACT points higher than standards-based grading students when all other variables are held constant.

Table 4.

Summary of Multiple Regression Analysis for Composite ACT

Model	Variable	*B*	SE_B	β
1	Constant	24.404	.192	
	Cum. GPA (Z)	3.129	.196	.665*
2	Constant	25.468	.263	
	Cum. GPA (Z)	3.113	.187	.662*
	School Type (Grading)	-2.076	.368	-.224*
3	Constant	23.000	.633	
	Cum GPA (Z)	3.393	.194	.721*
	School Type (Grading)	-1.989	.359	-.215*
	Gender	1.626	.381	.176*

Note. *p < .05; *B* = unstandardized regression coefficient; SE_B = Standard error of the coefficient; β = standardized coefficient

Discussion

This study expanded upon previous research by attempting to gain an understanding of the effect of a high school's grading practices, whether standards-based grading or traditional grading, on ACT scores and GPA. Results from this study indicate that GPAs remain unchanged and ACT scores may be negatively impacted when school utilize standards-based grading. Mastery learning involves an environment in which students are permitted multiple opportunities to achieve at high levels rather than being confined to a system promoting "one and done" assessments plotted on a bell curve (Block, 1979). As students are provided multiple opportunities to demonstrate their learning in standards-based grading without fear of permanent

point reduction, a difference in GPAs might have been expected due to opportunities for students to improve upon less-than-proficient first attempts. In this study, however, differences in GPAs were not statistically significant between traditional grading and standards-based grading practices, suggesting that GPAs are not affected by grading practices; however, there does appear to be a relationship between traditional grading practices, GPA, and standardized test scores when compared to standards-based grading.

One hypothesis is that students adjust to whichever grading practices they are exposed to and work toward their desired course marks. Bonesronnig (2004) concluded that students who are subjected to different grading systems often adjust accordingly during their secondary years; therefore, it is plausible that students in the standards-based grading school adjusted in the same way traditionally graded students settled in to the school norm. Furthermore, Perry (1970) indicated that students in high school tend to be in a dualistic mindset where they perceive the teacher to be "the Authority" that holds the right answers. Despite the grading practices, students could perceive learning as a means to appease the teacher and grading method as opposed to mastery of content. Fried (2005) describes students playing the game of school in which students muddle through the day in order to complete work, please the teacher, and earn grades. If the rules of "the game" remain relatively the same, despite a change in grading practices, student curiosity and the overall learning experience likely remain the same (Fried, 2005). High school students might adjust accordingly to any subtle rule changes, such as replacing extraneous point bearing opportunities with reassessment, and produce similar grade point averages because their goal is not mastery of content, but instead, point accumulation towards a desired final course grade. This would, anecdotally, account for no difference in GPA between grading practices.

Haptonstall (2010) and Pollio and Hochbein (2015) concluded that standards-based grades have a stronger association with standardized test scores when compared to traditional grades. Rosales (2013) produced results suggesting grading type did not influence Algebra end-of-course exam scores. Because the aforementioned research (Haptonstall, 2010; Pollio & Hochbein, 2015; Rosales, 2013) suggested mixed results, this study's assertion that GPA and traditional grading practices combined are able to predict ACT scores with some degree of success is not surprising. Madaus, Higgins, and Russell (2009) suggest that students in high school often perceive high stakes testing as a form of "Pavlovian conditioning" in which carrots and sticks direct their behavior. High school students accustomed to chasing points in traditional grading may view college entrance exams as yet another means to produce positive results. Given no significant increase in prediction power when considering standards-based grading practices in the regression equation of this study, students could view ACT scores as a means to avoid a punishment or earn a reward, as opposed to reflect mastery of content. This may, anecdotally, account for a traditional grading practice edge in predicting ACT scores when compared to standards-based grading.

According to Peters and Buckmiller (2014), this study is important in addressing a paucity of previous quantitative research on standards-based grading. While the findings of this study are limited to the schools studied, the results may be indicative of what may be happening elsewhere. The high school students experiencing traditional grading practices in this study scored significantly higher on the ACT. Schools leaders are left in a quandary. Given a solid theoretical base supporting standards-based grading (e.g., Bostic, 2012; Iamarino, 2014) and conflicting quantitative evidence supporting standards-based grading (e.g., Haptonstall, 2010; Pollio & Hochbein, 2015; Rosales, 2013), is there a strong enough return on investment to

overcome the necessary time and energy that may be required when stakeholders resist changing grading practices? Parents will ask questions such as, "How will a shift to standards-based grading affect my son or daughter's chances of getting into college?" Results from this study indicate GPAs remain unchanged and ACT scores may be negatively impacted. In addition to questions about GPAs and ACT scores, community concerns surrounding standards-based grading include fear of the unknown and inconsistent implementation (Frankin, Buckmiller, & Kruse, 2016; Schiffman, 2016). In response to these concerns, principals and central office administrators should consider proactively learning from case studies and anecdotes provided in scholarly literature (e.g., Peters & Buckmiller, 2014; Urich, 2012) when electing to make a transition to standards-based grading practices.

Because the sample used in this study comes from a rural setting, this study should be replicated at additional high schools, particularly with students in urban settings and with more diversity as measured by race, ethnicity, and socioeconomic status. Further research is needed involving student motivation for earning course grades and for completing the ACT.

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