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Differential Grading Standards Among High Schools

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Abstract

The primary purpose of this study was to investigate differential grading standards among public high schools. This study focused on documenting differential grading standards between 1998 and 2002. Five years were studied to verify that the observed differences in grading standards were not transient. Differences in grading standards among high schools were inferred by comparing the regressions of high school grade point averages (HSGPA) onto ACT Assessment (ACT) scores. The ACT is an achievement test battery used by colleges for admission, and is usually taken in the eleventh or twelfth grade of high school. It is composed of four tests: English, Mathematics, Reading, and Science. A fifth Composite score is the average of the four test scores. This study used the ACT Composite score, English score, and Mathematics score and compared the regressions of overall HSGPA, English HSGPA, and mathematics HSGPA onto those ACT scores. The ACT scores were used as objective measures of student achievement across schools and over time.

Given that the ACT is a constant standard that is applied equally to all students in all schools, the results of this study imply that grades are a relative standard, in that they can vary from school to school. A particular student's grades depend not only on the student's achievement, but also on the school the student attends. ACT scores, in contrast, have the same meaning at all schools. In this sense, grades are norm referenced within schools, and the ACT is criterion referenced across schools. This difference between high school grades and the ACT is one characteristic of the ACT that makes the ACT an important complement to high school grades in making college admission decisions.

Acknowledgement

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Differential Grading Standards Among High Schools

This report documents the results of a study comparing the distributions and regressions of ACT Assessments (ACT) scores and high school grade point averages (HSGPA) over the five years 1998 to 2002. The ACT is an achievement test battery used by colleges for admission purposes, and is usually taken in the eleventh or twelfth grade of high school. It is composed of four tests: English, Mathematics, Reading, and Science. A fifth Composite score is the average of the four test scores. The primary purpose of the study was to investigate differential grading standards among different public high schools. This study considered the distributions of the ACT Composite, English, and Mathematics scores and the distributions of overall HSGPA, English HSGPA, and mathematics HSGPA. Regressions of respective pairs of HSGPA on ACT score were computed. Differences in the regressions imply different grading standards among high schools.

This study distinguishes between grade inflation and differential grading standards. Grade inflation is an increase in grades over time for the same level of student achievement. Differential grading standards result from different schools assigning different grades for the same level of student achievement. This study focuses on differential grading standards, but does so over five years. The ACT tests are used as an objective measure or standard of student achievement across schools and over time. Different forms of the ACT tests are used over time, but great care is taken in their development to ensure that all forms measure the same content and have the same difficulty and variability. Statistical adjustments are also employed to ensure that all forms have the same score distributions.

The hypothesis under investigation in this study is that, unlike ACT scores, high school grades as measures of achievement vary from school to school. Stated differently, a high school

student's grades can depend not only on the student's level of achievement, as measured by ACT scores, but also on the level of achievement of other students in the high school. Moreover, different schools can have different average levels of achievement.

An early review paper concerning the variability in grading standards among different high schools was by Linn (1966). Linn noted that this variability in high school grading standards decreased their usefulness as predictors of success in college, but that combining HSGPA with a standardized achievement test, such as the ACT, increased prediction accuracy.

The present study is a follow-up study to a previous study by Ziomek and Svec (1995). They studied ACT Composite scores and overall HSGPA from 1990 to 1994. They found evidence for modest grade inflation and substantial differential grading standards. They also reviewed the literature on grade inflation and differential grading standards. The most recent empirical study on differential grading standards they found was done by the Office of Educational Research and Improvement (OERI, 1994), using data from the National Educational Longitudinal Study of 1988. That study considered eighth grade English grades and reading test scores, and it found that less affluent schools had more lenient grading standard than more affluent schools.

In a more recent paper, Bassiri and Schulz (2003) found differences in grading standards between different high schools, and they developed a method using the ACT to adjust HSGPA for differential grading standards. Their "ACT-adjusted HSGPA" was a better predictor of first year college GPA than was unadjusted HSGPA.

This study focuses on documenting differential grading standards over the time period 1998 to 2002 in public high schools. Five years are studied to verify that the differences in grading standards were not transient, but remained stable over time. All students used in the analysis took the ACT. Because a primary purpose of the ACT is college admission, these students were, in

general, college-bound. Hence, this study focuses on high school grading standards used in the college-preparatory high school curriculum.

Data

The data used for the analysis were drawn from students who graduated from public high schools in the spring of 1998, 1999, 2000, 2001, and 2002, and who took the ACT in the eleventh or twelfth grade in high school. All students had valid scores for all five ACT scores. If a student took the ACT more than once, then only the student's most recent score was included in the analysis. ACT collects course information on 30 different courses when students register to take the ACT. Overall HSGPA is based on the students' self-reported grades in 23 of these 30 courses. (Foreign language and art courses are excluded.) English HSGPA is based on grades in five English-related courses, and mathematics HSGPA is based on grades in seven mathematics-related courses. Sawyer, Laing, & Houston (1988) studied the accuracy of these self-reported grades and found them sufficiently accurate for research and counseling. A more detailed description of the course data is given in the Results section (See Table 9).

Method

From the data of students attending each school, an ACT school mean was calculated. Only schools with at least 30 students were included. Then for each of the five years, the schools were divided into quintiles based on the school means. Quintiles are like quartiles except that instead of dividing the schools into four groups of 25% like quartiles, quintiles divide the schools into five groups of 20%. This was done separately for the ACT Composite score, the ACT English score and the ACT Mathematics score. The number of schools and the particular group of schools selected were allowed to vary for each of the three ACT scores analyzed. This means that the schools used in the analysis of the ACT Composite score could differ from the schools

used in the analysis of the ACT English score and the ACT Mathematics score, and the English score schools could differ from the Mathematics score schools.

For each of the three ACT scores, the schools included in the analysis were those that remained in the 1st quintile group (bottom 20% of schools) and those that remained in the 5th quintile group (top 20% of schools) on each ACT score for all five years. The middle 60% of schools was not used in the analysis. The effect of differential grading standards is more clearly demonstrated by comparing the top 20% and bottom 20% of schools. For each ACT score the same schools were used for all of the five years, and only students from schools that remained in the 1st quintile group and the 5th quintile group for all five years were included in the analysis. For the ACT Composite score, the number of schools in the 1st quintile group and the 5th quintile group were 664 and 573, respectively, and these schools were the same from year to year for all five years. For the ACT English test score there were, for all five years, the same 620 schools in the 1st quintile group and the same 517 schools in the 5th quintile group. For the ACT Mathematics test score the same 656 schools were in the 1st quintile group and the same 626 schools were in the 5th quintile group for all five years. Although within each ACT score the same schools were used for all five years, the graduating class of students in those schools changed from year to year.

As previously mentioned, the number of schools could differ among the three analyses: ACT Composite, ACT English, and ACT Mathematics. There were 457 1st quintile schools that were common to all three analyses. There were 362 5th quintile schools that were common to all three analyses. The schools involved in each of the three analyses did differ, but there were a majority of schools common to all three analyses. Quintiles were chosen over other possible groupings (such as quartiles and deciles) because they yielded the best balance between having schools

remain in their quintiles for all five years and having a large number of schools common to all three analyses.

The distributions of ACT scores and HSGPA's in the 1st and 5th quintile groups were examined. This was done for all five years. Correlations between the ACT scores and HSGPA's were then computed within each quintile group for each year. Next, 1st quintile group and 5th quintile group regressions of HSGPA's on ACT scores were compared for all five years. Finally, proportions of students taking the 30 courses within each quintile group were compared across all five years.

Results

Comparison of HSGPA and ACT Distributions

Table 1 contains statistics for the ACT Composite scores of students in 1st quintile schools, students in 5th quintile schools, and students in both quintiles combined, for the five years studied. Table 2 contains statistics for overall HSGPA. Both tables contain statistics on student-level data, as do all the tables and all the graphs that follow.

As can be seen in Table 1, the statistics for students in 1st quintile schools are quite different from those of students in 5th quintile schools. This is clearly demonstrated by noting that 75% of the students in 1st quintile schools have ACT Composite scores *less* than or equal to 19 or 20, the 75th percentile depending on the year considered. Whereas 75% of students in 5th quintile schools have ACT Composite scores *greater* than 20, the 25th percentile for all five years. (All percentiles were calculated as approximate cumulative percents, that is, the Tth percentile has approximately T% of the student at or below that score.) The difference in means for the two

TABLE 1

ACT Composite Statistics for all Five Years

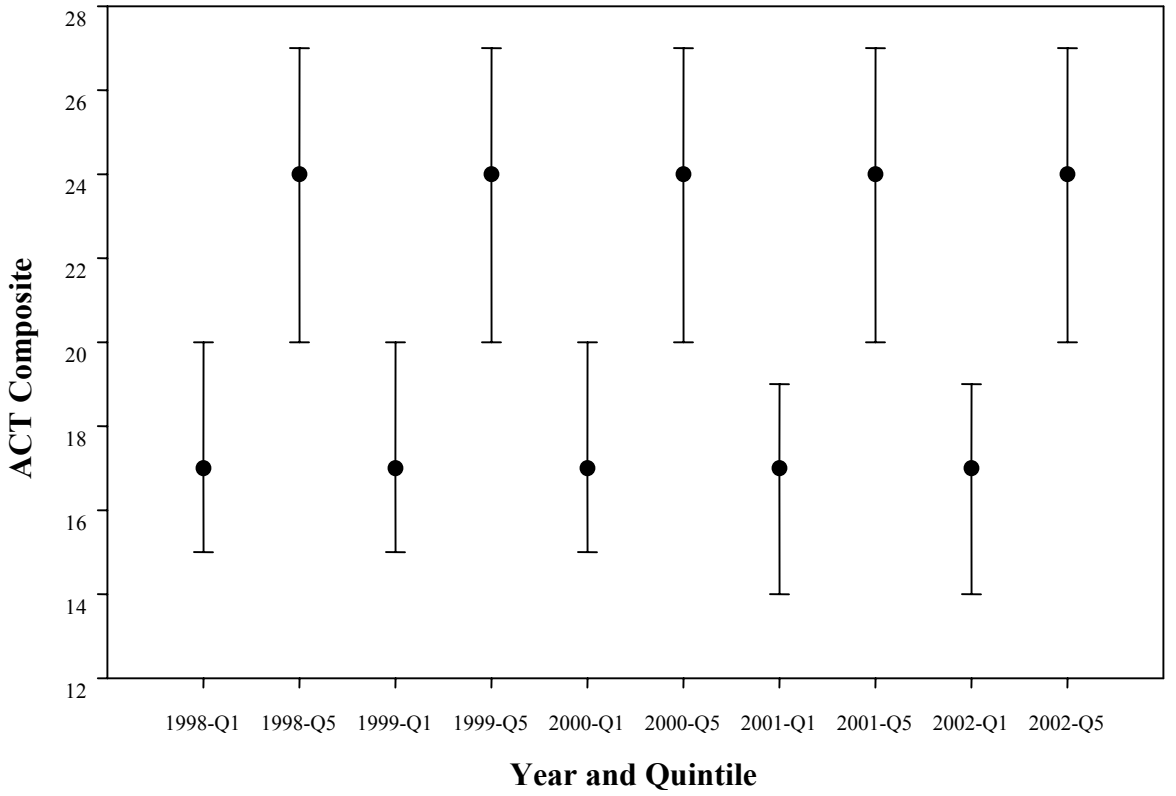
Year	Quintile	N	Mean	SD	Skew	P25	P50	P75
1998	**1**	53,939	17.5	3.9	0.81	15	17	20
1998	**5**	96,586	23.7	4.6	0.04	20	24	27
1998	**Total**	150,525	21.5	5.3	0.20	17	21	25
1999	**1**	55,013	17.4	3.8	0.76	15	17	20
1999	**5**	94,235	23.7	4.5	0.02	20	24	27
1999	**Total**	149,248	21.3	5.3	0.20	17	21	25
2000	**1**	59,434	17.3	3.8	0.80	15	17	20
2000	**5**	101,833	23.7	4.6	0.05	20	24	27
2000	**Total**	161,267	21.3	5.3	0.22	17	21	25
2001	**1**	56,668	17.2	3.8	0.78	14	17	19
2001	**5**	98,136	23.7	4.6	0.03	20	24	27
2001	**Total**	154,804	21.3	5.3	0.20	17	21	25
2002	**1**	52,997	17.1	3.7	0.78	14	17	19
2002	**5**	86,536	23.7	4.6	0.04	20	24	27
2002	**Total**	139,533	21.2	5.3	0.22	17	21	25

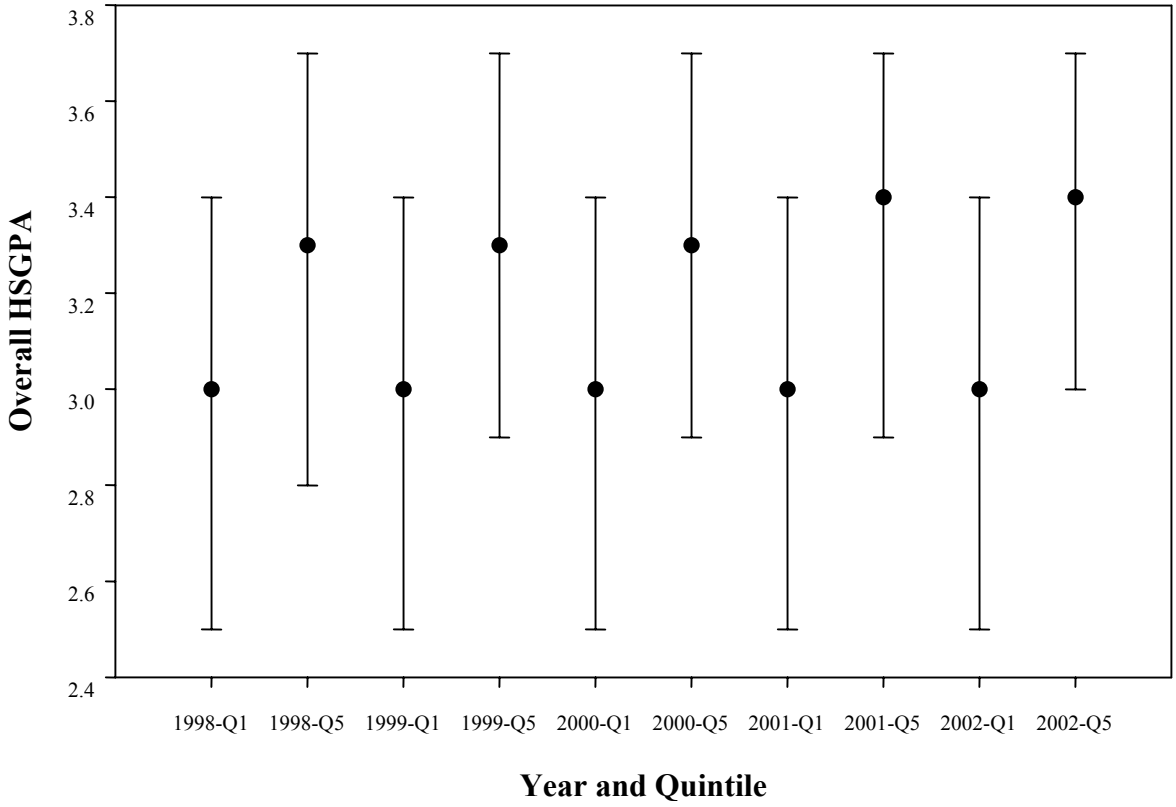
TABLE 2

Overall HSGPA Statistics for all Five Years

Year	Quintile	N	Mean	SD	Skew	P25	P50	P75
1998	**1**	53939	2.9	0.61	-0.26	2.5	3.0	3.4
1998	**5**	96586	3.2	0.58	-0.65	2.8	3.3	3.7
1998	**Total**	150525	3.1	0.61	-0.50	2.7	3.2	3.6
1999	**1**	55013	2.9	0.60	-0.27	2.5	3.0	3.4
1999	**5**	94235	3.2	0.57	-0.68	2.9	3.3	3.7
1999	**Total**	149248	3.1	0.60	-0.51	2.7	3.2	3.6
2000	**1**	59434	2.9	0.60	-0.26	2.5	3.0	3.4
2000	**5**	101833	3.2	0.57	-0.71	2.9	3.3	3.7
2000	**Total**	161267	3.1	0.60	-0.52	2.7	3.2	3.6
2001	**1**	56668	2.9	0.59	-0.29	2.5	3.0	3.4
2001	**5**	98136	3.3	0.57	-0.72	2.9	3.4	3.7
2001	**Total**	154804	3.1	0.60	-0.54	2.7	3.2	3.6
2002	**1**	52997	3.0	0.59	-0.30	2.5	3.0	3.4
2002	**5**	86536	3.3	0.56	-0.77	3.0	3.4	3.7
2002	**Total**	139533	3.2	0.60	-0.56	2.8	3.2	3.6

Figure 1. Plot of ACT Composite and Overall HSGPA Interquartile Ranges





groups of schools, averaged over the five years, is 6.4, which is 1.5 times the average within-quintile group standard deviation of 4.2. Such differences are to be expected because the quintile groups were determined on the basis of ACT Composite scores.

In Table 2, the disparity between the 1st and 5th quintile group HSGPA statistics are not nearly as extreme as the differences for the ACT Composite score. The difference in means for the two quintile groups averaged over the five years is 0.32, which is only a little more than one-half of the average within-quintile group standard deviation of 0.58. If one compares the 25th, 50th, and 75th percentiles in the 1st quintile group to the same percentiles in the 5th quintile group, one finds that the corresponding percentiles in the two quintile groups are relatively close together, a little over one-half of the average within-quintile group standard deviation. For the ACT Composite score the differences between the corresponding percentiles in the 1st and 5th quintile groups were always greater than the average within quintile group standard deviation. Despite the large differences in ACT Composite score distributions between the students in the 1st and 5th quintile groups, the differences between their overall HSGPA distributions are much smaller. This is to be expected because the quintile groups were based on ACT Composite score means. Selection was explicit on ACT scores, but it is only implicit on HSGPA, and it is determined by the correlation between HSGPA and ACT scores. These correlations are presented in Table 7, and are in the approximate range of 0.50 to 0.60.

Figure 1 graphically illustrates the results presented in Tables 1 and 2. Along the horizontal axes of both graphs in Figure 1 are the five years arranged with each year occurring twice, once with the suffix -Q1 and once with the suffix -Q5. The –Q1 suffix denotes the 1st quintile group for that year and the –Q5 suffix denotes the 5th quintile group for that year. The vertical lines in both graphs connect the 25th percentile to the 75th percentile. The vertical lines graphically

represent the length and location of the interquartile range (IQR) which, in turn, represents the central 50% of students ACT Composite scores or overall HSGPA's. On each line, the median is located between the 25th and 75th percentile and is denoted by a solid circle. The two graphs are strikingly different. For the ACT Composite there is little or no overlap between the locations of the 1st and 5th quintile group IQR's, but for overall HSGPA there is a great deal of overlap between the locations of the two IQR's for all five years. This result occurs because the correlation between HSGPA and ACT score is considerably less than unity. If the correlation were near unity then the 1st and 5th quintile group overall HSGPA distributions could be nearly as discrepant as the 1st and 5th quintile group ACT Composite score distributions.

It is important to carefully present descriptions of the 1st and 5th quintile group HSGPA and ACT score distributions for all three of the areas being studied: overall, English, and mathematics. The distributions of ACT scores and HSGPA can affect the interpretations of the regressions of HSGPA on ACT scores that are presented in the next section. This is especially true because of the discrepant nature of the 1st and 5th quintile group ACT score distributions. As will be seen in the next section the interpretation of the English HSGPA on ACT English score regression will involve a careful consideration of the distributions of ACT English scores in the 1st and 5th quintile groups.

Table 3, Table 4, and Figure 2 present analyses of students' ACT English scores and their HSGPA's in English courses. The results are very similar to the results obtained for the ACT Composite score and overall HSGPA. One unusual result requires explanation. The 75th percentile for English HSGPA equals 4.0 in the 5th quintile group for all five years. This is caused by the frequency distribution of English HSGPA having greater than a 25% frequency at the value 4.0. No value less than 4.0 can have 75% of the students with HSGPA's less than or

equal to that value, therefore 4.0 becomes the 75th percentile as well as the 100th percentile. The 100th percentile for HSGPA in the 5th quintile also is 4.0. This does not change our interpretation of the results, and as before, inspection of Figure 2 reveals the main result. There is nearly no overlap between the locations of the 1st and 5th quintile group English score IQR's, but a large amount of overlap between the locations of the 1st and 5th quintile group English HSGPA IQR's.

Table 5, Table 6, and Figure 3 present analyses of students' ACT Mathematics scores and their HSGPA's in mathematics courses. The results are similar to the previous results, but possess some unusual features. Inspection of Table 5 and Figure 3 show that the IQR's for the ACT Mathematics scores are unusually narrow especially for the last four years when compared to the 1st quintile group Composite and English score IQR's and the 5th quintile group Mathematics score IQR's. For all five years the skewness of the 1st quintile group Mathematics scores is much larger than the skewness of the 5th quintile group Mathematics scores, and the skewness values for the 1st quintile group Mathematics scores are much larger than all skewness values in all previous tables. This indicates the distributions of ACT Mathematics scores in the 1st quintile group have some high scoring students, but the distributions are relatively narrow and have well over 75% of their students scoring below the 25th percentile of the students in the 5th quintile group. Of the three ACT scores studied, the difference between the score distributions in the 1st and 5th quintile groups is greatest for the Mathematics score. Figure 3 gives a graphical display of these results.

TABLE 3

ACT English Statistics for all Five Years

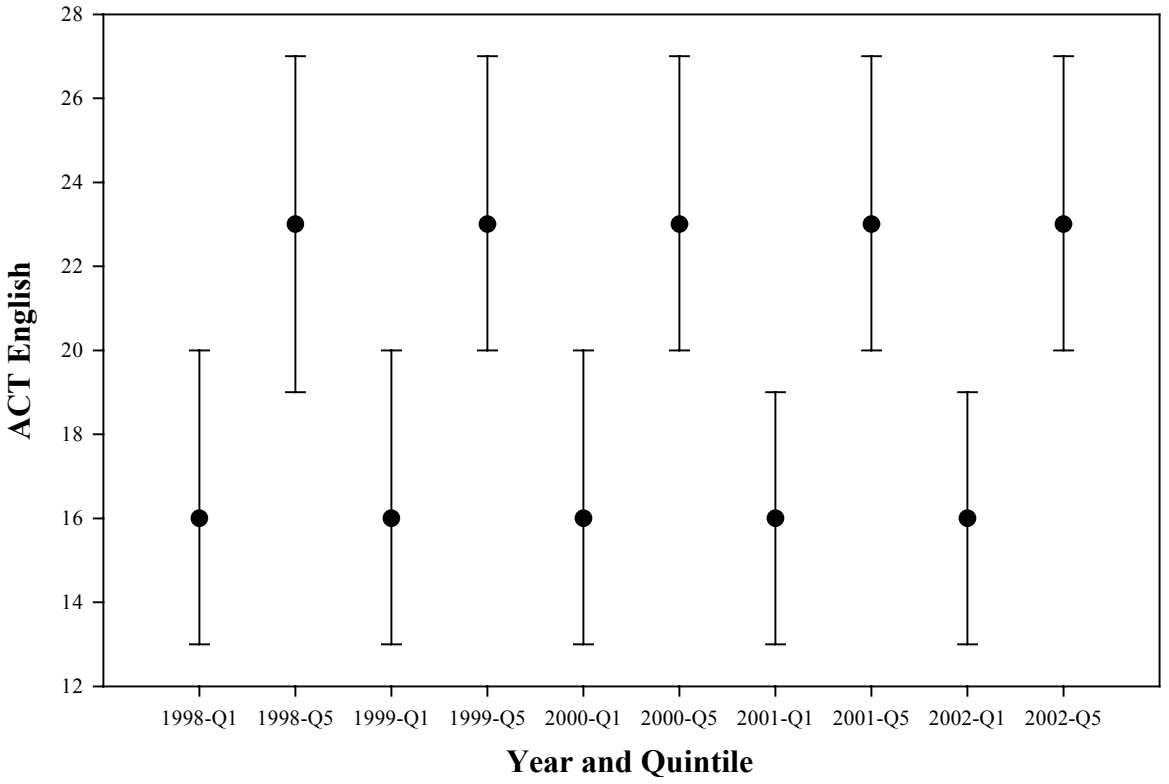
Year	Quintile	N	Mean	SD	Skew	P25	P50	P75
1998	**1**	51,461	16.6	4.8	0.52	13	16	20
1998	**5**	88,632	23.0	5.1	-0.10	19	23	27
1998	**Total**	140,093	20.7	5.9	0.05	16	20	25
1999	**1**	52,493	16.5	4.9	0.43	13	16	20
1999	**5**	87,457	23.2	5.2	-0.09	20	23	27
1999	**Total**	139,950	20.7	6.1	0.03	16	21	25
2000	**1**	56,445	16.4	4.9	0.47	13	16	20
2000	**5**	94,647	23.2	5.2	-0.08	20	23	27
2000	**Total**	151,092	20.7	6.1	0.05	16	21	25
2001	**1**	54,024	16.3	4.9	0.46	13	16	19
2001	**5**	91,434	23.3	5.3	-0.09	20	23	27
2001	**Total**	145,458	20.7	6.2	0.05	16	20	25
2002	**1**	50,213	16.2	4.9	0.44	13	16	19
2002	**5**	79,994	23.3	5.4	-0.06	20	23	27
2002	**Total**	130,207	20.6	6.3	0.09	16	20	25

TABLE 4

English HSGPA Statistics for all Five Years

Year	Quintile	N	Mean	SD	Skew	P25	P50	P75
1998	**1**	51,461	3.0	0.70	-0.42	2.5	3.0	3.5
1998	**5**	88,632	3.3	0.65	-0.81	3.0	3.3	4.0
1998	**Total**	140,093	3.2	0.68	-0.65	2.7	3.3	3.7
1999	**1**	52,493	3.0	0.68	-0.43	2.5	3.0	3.5
1999	**5**	87,457	3.3	0.63	-0.84	3.0	3.3	4.0
1999	**Total**	139,950	3.2	0.67	-0.67	2.8	3.3	3.8
2000	**1**	56,445	3.0	0.68	-0.44	2.5	3.0	3.5
2000	**5**	94,647	3.3	0.63	-0.88	3.0	3.4	4.0
2000	**Total**	151,092	3.2	0.67	-0.70	2.8	3.3	3.8
2001	**1**	54,024	3.0	0.68	-0.49	2.6	3.0	3.5
2001	**5**	91,434	3.3	0.63	-0.89	3.0	3.5	4.0
2001	**Total**	145,458	3.2	0.67	-0.72	2.8	3.3	3.8
2002	**1**	50,213	3.0	0.68	-0.49	2.7	3.0	3.6
2002	**5**	79,994	3.4	0.62	-0.95	3.0	3.5	4.0
2002	**Total**	130,207	3.2	0.66	-0.74	2.8	3.3	3.8

Figure 2. Plot of ACT English and English GPA Interquartile Ranges



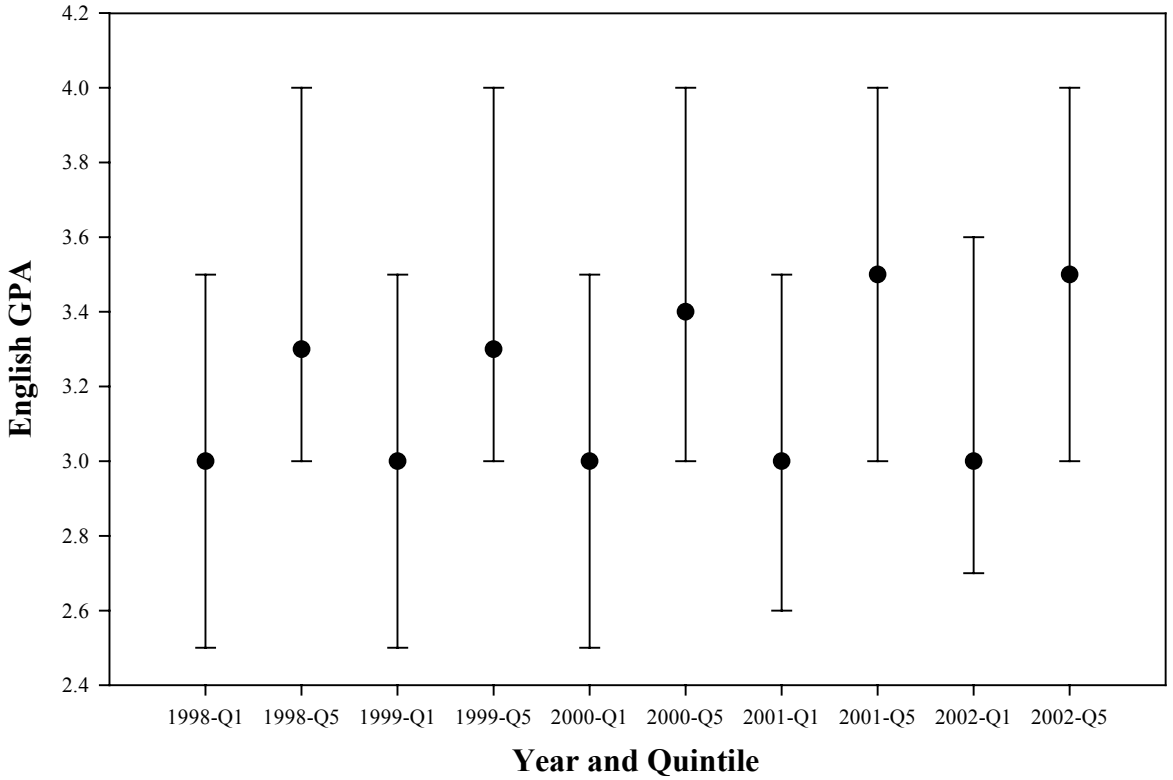


TABLE 5

ACT Mathematics Statistics for all Five Years

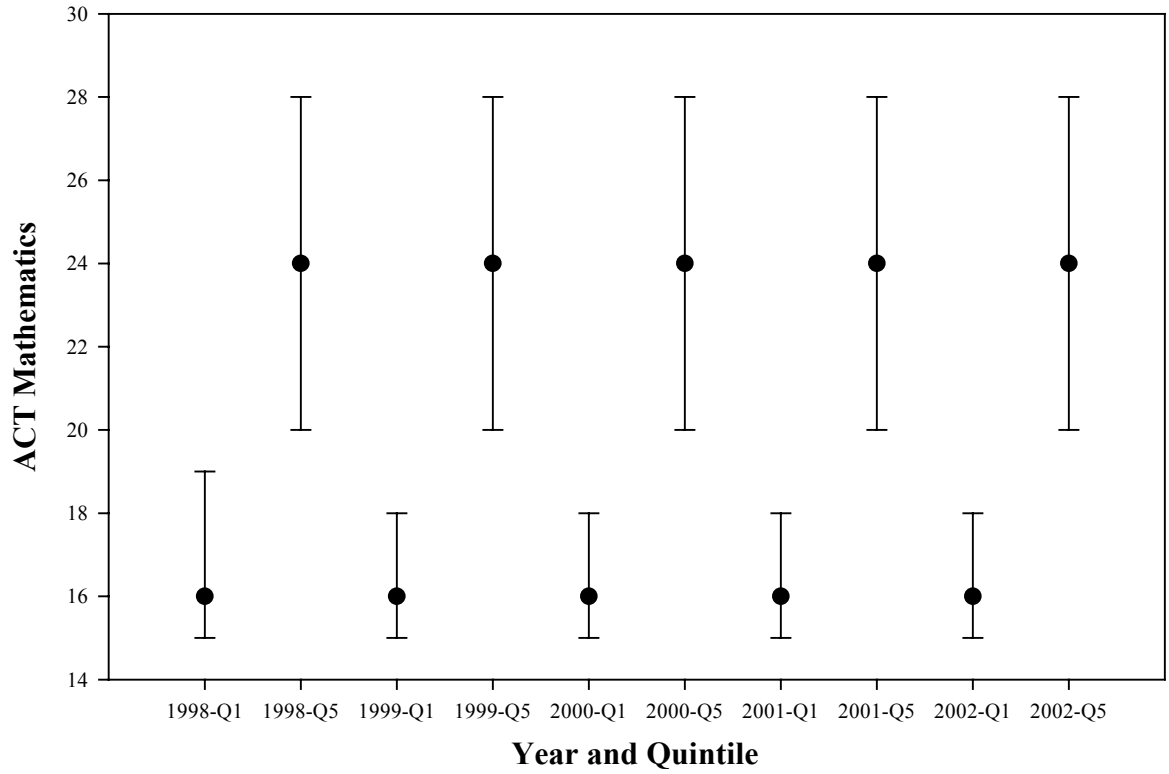
Year	Quintile	N	Mean	SD	Skew	P25	P50	P75
1998	**1**	52,387	17.1	3.7	1.24	15	16	19
1998	**5**	101,983	24.1	5.1	0.05	20	24	28
1998	**Total**	154,370	21.7	5.8	0.32	17	21	26
1999	**1**	53,340	17.0	3.5	1.19	15	16	18
1999	**5**	98,613	23.9	5.0	0.10	20	24	28
1999	**Total**	151,953	21.5	5.6	0.37	17	21	26
2000	**1**	57,542	16.9	3.5	1.23	15	16	18
2000	**5**	106,516	24.0	5.1	0.09	20	24	28
2000	**Total**	164,058	21.5	5.7	0.38	17	21	26
2001	**1**	55,077	16.9	3.4	1.23	15	16	18
2001	**5**	103,100	23.9	5.1	0.07	20	24	28
2001	**Total**	158,177	21.5	5.7	0.37	17	21	26
2002	**1**	51,829	16.8	3.4	1.30	15	16	18
2002	**5**	89,297	24.0	5.1	0.08	20	24	28
2002	**Total**	141,126	21.4	5.7	0.40	16	21	26

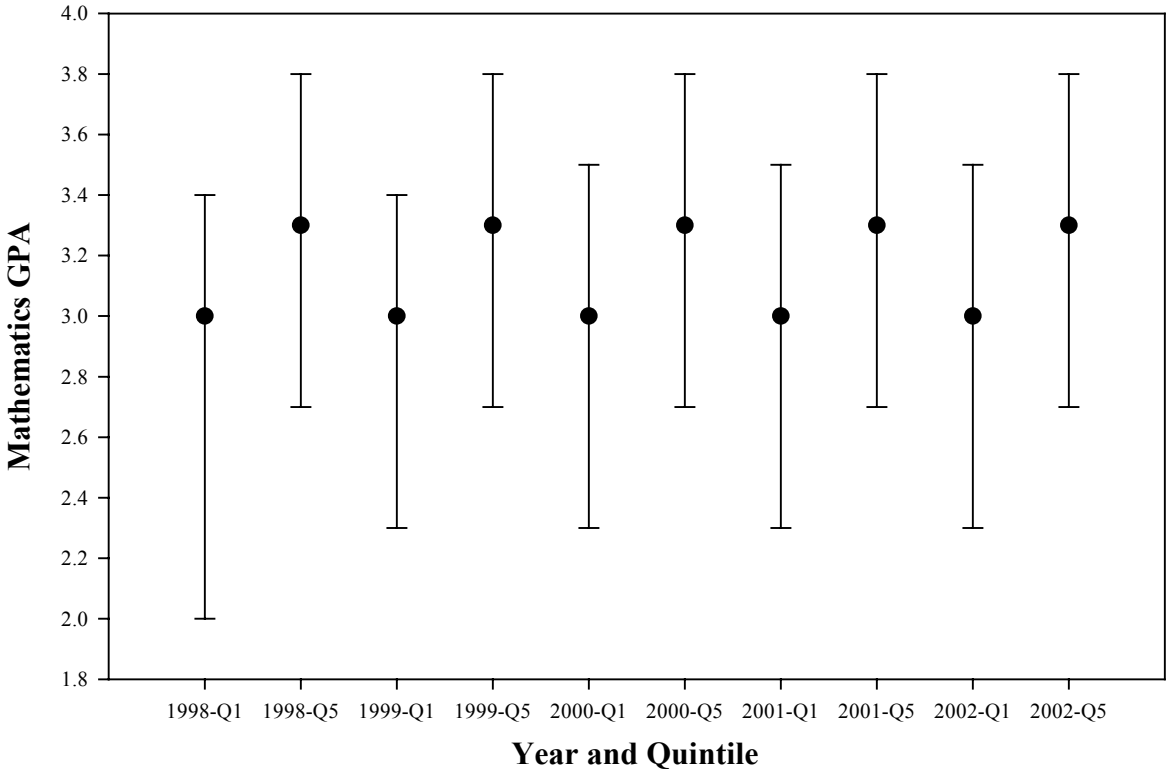
TABLE 6

Mathematics HSGPA Statistics for all Five Years

Year	Quintile	N	Mean	SD	Skew	P25	P50	P75
1998	**1**	52,387	2.8	0.82	-0.39	2.0	3.0	3.4
1998	**5**	101,983	3.1	0.74	-0.73	2.7	3.3	3.8
1998	**Total**	154,370	3.0	0.79	-0.62	2.5	3.0	3.7
1999	**1**	53,340	2.8	0.81	-0.38	2.3	3.0	3.4
1999	**5**	98,613	3.1	0.74	-0.74	2.7	3.3	3.8
1999	**Total**	151,953	3.0	0.78	-0.61	2.5	3.0	3.7
2000	**1**	57,542	2.8	0.81	-0.35	2.3	3.0	3.5
2000	**5**	106,516	3.2	0.73	-0.77	2.7	3.3	3.8
2000	**Total**	164,058	3.0	0.78	-0.62	2.5	3.0	3.7
2001	**1**	55,077	2.8	0.80	-0.37	2.3	3.0	3.5
2001	**5**	103,100	3.2	0.73	-0.78	2.7	3.3	3.8
2001	**Total**	158,177	3.0	0.77	-0.64	2.5	3.0	3.7
2002	**1**	51,829	2.8	0.80	-0.38	2.3	3.0	3.5
2002	**5**	89,297	3.2	0.72	-0.82	2.7	3.3	3.8
2002	**Total**	141,126	3.1	0.77	-0.65	2.5	3.0	3.7

Figure 3. Plot of ACT Mathematics and Mathematics GPA Interquartile Ranges





HSGPA and ACT Correlation and Regression

It is of interest to consider the correlation between ACT scores and HSGPA's in the two different quintiles. Table 7 contains correlations between ACT Composite score and overall HSGPA, ACT English score and English HSGPA, and ACT Mathematics score and mathematics HSGPA. The correlations are very consistent across the five years for both of the quintile groups. The correlations for the 5th quintile group are everywhere higher than the correlations for the 1st quintile group, though the differences are moderate. The ACT is carefully constructed to measure the knowledge and skills taught in the typical college-preparatory high school curriculum. ACT conducts national curriculum studies to ensure the appropriateness of the content of the ACT Tests. The last such study reviewed state educational standards for the 49 states that had published such standards, and surveyed thousands of high school teachers, along with 1,500 curriculum specialists. The larger correlations for the 5th quintile group schools indicates a higher agreement between their grades and the ACT test scores than the agreement between the ACT test scores and the grades in the1st quintile group schools. However, the 5th quintile group schools tend to have larger variances than the 1st quintile group schools.

The hypothesis being investigated is that the 1st quintile group schools are using more lenient grading standards than the 5th quintile group schools. Comparing the 1st and 5th quintile group regressions of HSGPA on ACT score allows for a direct investigation of that hypothesis. The schools were classified into quintiles by conditioning on ACT score means. Regressing HSGPA on ACT score within each quintile estimates HSGPA means conditional on specific ACT scores within quintiles created by previous conditioning on ACT means. It is important to note that all conditioning is done on ACT scores or ACT means (which are calculated from ACT scores). If the schools in the 1st and 5th quintile groups are using the same grading standards, then it is

reasonable to expect the HSGPA on ACT score regressions in the two quintiles to be equal—have the same intercept and slope.

TABLE 7

Correlations Among ACT Scores and Corresponding HSGPA's for the First and Fifth Quintile in each of the Five Years

		Test, HSGPA		
Year	**Quintile**	**Composite**	**English**	**Mathematics**
1998	**1**	0.48	0.36	0.48
1998	**5**	0.60	0.48	0.61
1999	**1**	0.49	0.37	0.48
1999	**5**	0.60	0.49	0.60
2000	**1**	0.48	0.36	0.48
2000	**5**	0.59	0.48	0.60
2001	**1**	0.47	0.35	0.47
2001	**5**	0.59	0.48	0.58
2002	**1**	0.47	0.35	0.47
2002	**5**	0.59	0.48	0.58

Table 8 contains the slopes and intercepts for the three respective pairs of HSGPA on ACT score linear regressions. In all cases, linear regressions provided good fits in that cubic polynomial regressions increased the R^2 values by less than 0.01. Within each of the three ACT score regressions the results are very similar for all five years. Figure 4 displays the 1st and 5th quintile group regression lines for the overall HSGPA on ACT Composite score regression for the year 2000 which is typical for all five of the years. As can be seen, the regression lines have equal slopes but different intercepts, and it is clear that for students with the same ACT Composite score, 1st quintile group students have a higher mean overall HSGPA than 5th quintile group students. The 1st quintile group students have a mean overall HSGPA 0.14 points higher

than 5th quintile group students with the same ACT Composite score. As can be seen in Table 7 by comparing the 1st and 5th quintile group intercepts, the 1st quintile group's advantage varies from a high of 0.19 in 1998 to a low of 0.12 in 2002. The difference between the 1st and 5th quintile groups regression lines is statistically significant ($p < 0.01$).

TABLE 8

Linear Regression Coefficients for the Three HSGPA on ACT Score Regressions for the First and Fifth Quintile in each of the Five Years

		Overall		English		Mathematics	
Year	Quintile	Slope	Intercept	Slope	Intercept	Slope	Intercept
1998	Q1	0.076	1.60	0.052	2.13	0.108	0.930
	Q5	0.076	1.41	0.061	1.88	0.088	0.993
1999	Q1	0.077	1.60	0.051	2.16	0.112	0.886
	Q5	0.076	1.44	0.059	1.94	0.088	1.040
2000	Q1	0.075	1.63	0.050	2.19	0.110	0.948
	Q5	0.074	1.49	0.058	2.00	0.086	1.110
2001	Q1	0.075	1.66	0.050	2.22	0.111	0.935
	Q5	0.073	1.52	0.057	2.02	0.085	1.130
2002	Q1	0.075	1.68	0.048	2.27	0.110	0.969
	Q5	0.073	1.56	0.055	2.10	0.082	1.220

The situation is more complicated with English because the pairs of regression lines are not parallel. Figure 5 displays the 1st and 5th quintile group linear regressions of English HSGPA on ACT English score for the year 2000. The year 2000 regressions are typical of the regressions for all five years. Below the ACT English score of 23, the 1st quintile group regression is greater than the 5th quintile group regression. In this ACT score range 1st quintile group students are receiving higher average grades than 5th quintile group students with the same ACT score, and this implies that the 1st quintile group schools are using easier grading standards. Above the ACT score of 23, the situation is reverse. In this ACT score range, 5th quintile group students are

receiving higher average grades than 1st quintile group students with the same ACT score, implying an easier grading standard is being used by the 5th quintile group schools. Where they do not cross, the difference between the two regression lines is statistically significant ($p<0.01$).

Reference to Figure 2 can help in interpreting the result displayed in Figure 5. From Figure 2, it can be seen that 75% of the 1st quintile group students have ACT English scores less than 21. In the range of ACT scores where most of the 1st quintile group students are located the 1st quintile group schools are using easier grading standards. Only about 50% of the students in the 5th quintile group schools have ACT English scores greater than or equal to 23, so at least 50% of those 5th quintile group students are being graded more rigorously than the 1st quintile group students. However, it appears that those 5th quintile group students with ACT English scores above 23 are being graded more leniently than the 1st quintile group students.

Figure 6 displays the 1st and 5th quintile group regressions of mathematics HSGPA on ACT Mathematics score for the year 2000. The year 2000 regressions are typical for all five years. The 1st quintile group regression is above the 5th quintile group regression everywhere, though the two lines would cross at some ACT score below 10. From Figure 3, it can be determined that 75% of the 1st quintile group students have ACT Mathematics scores above 14 so plotting the regression lines only down to an ACT score of 10 appears adequate. Clearly, the 1st quintile group schools are using easier grading standards than the 5th quintile group schools, and the discrepancy in grading standards increases as ACT score increase. However, from Figure 3, one can see that 75% of the 1st quintile group students have ACT scores below 20 so there are few 1st quintile group students in the upper ranges of ACT scores. The difference between the two regression lines is statistically significant at the 0.01 alpha level.

FIGURE 4. Plot of the Year 2000 Linear Regressions of Overall HSGPA on ACT Composite Score

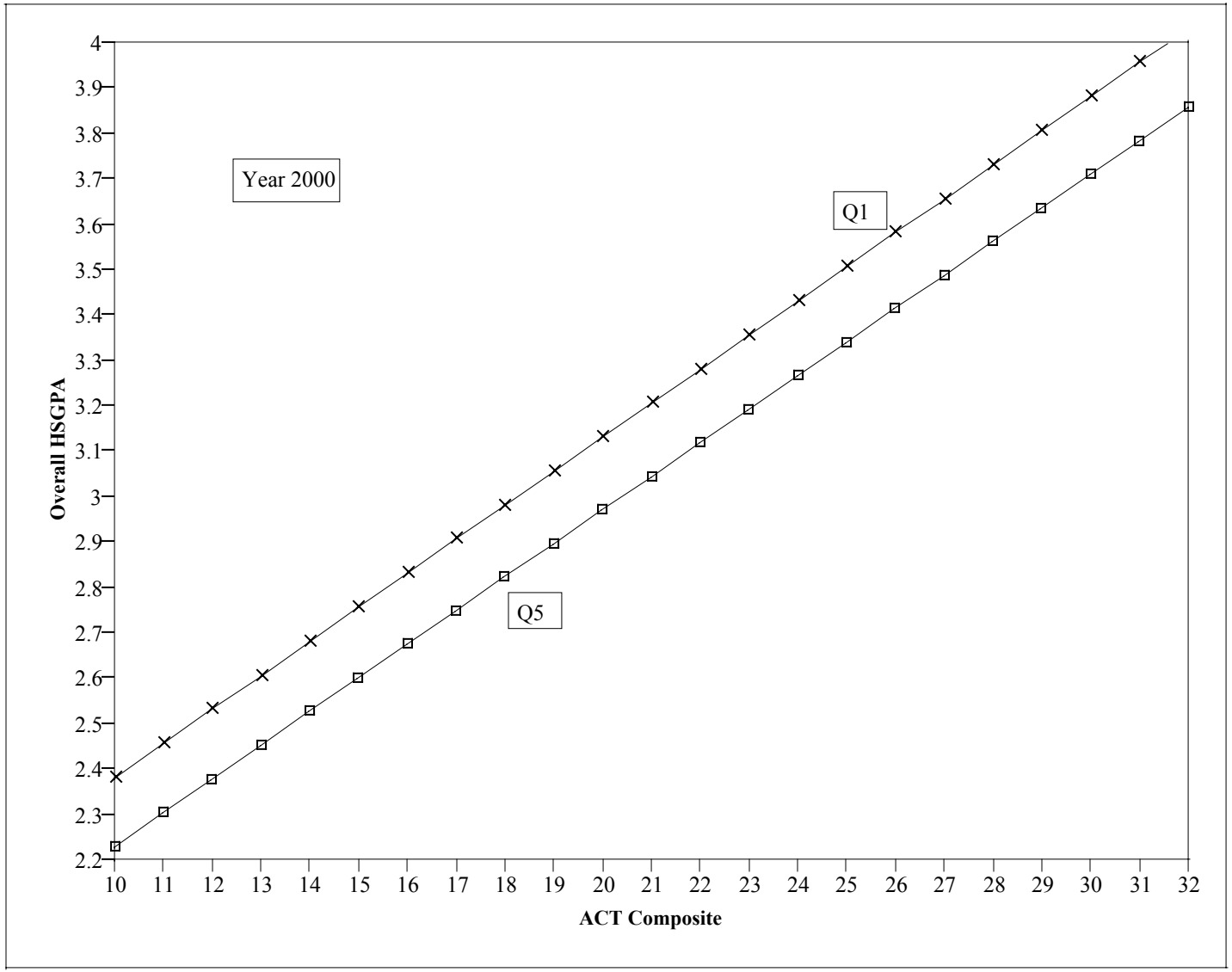


FIGURE 5. Plot of the Year 2000 Linear Regressions of English HSGPA on ACT English Score

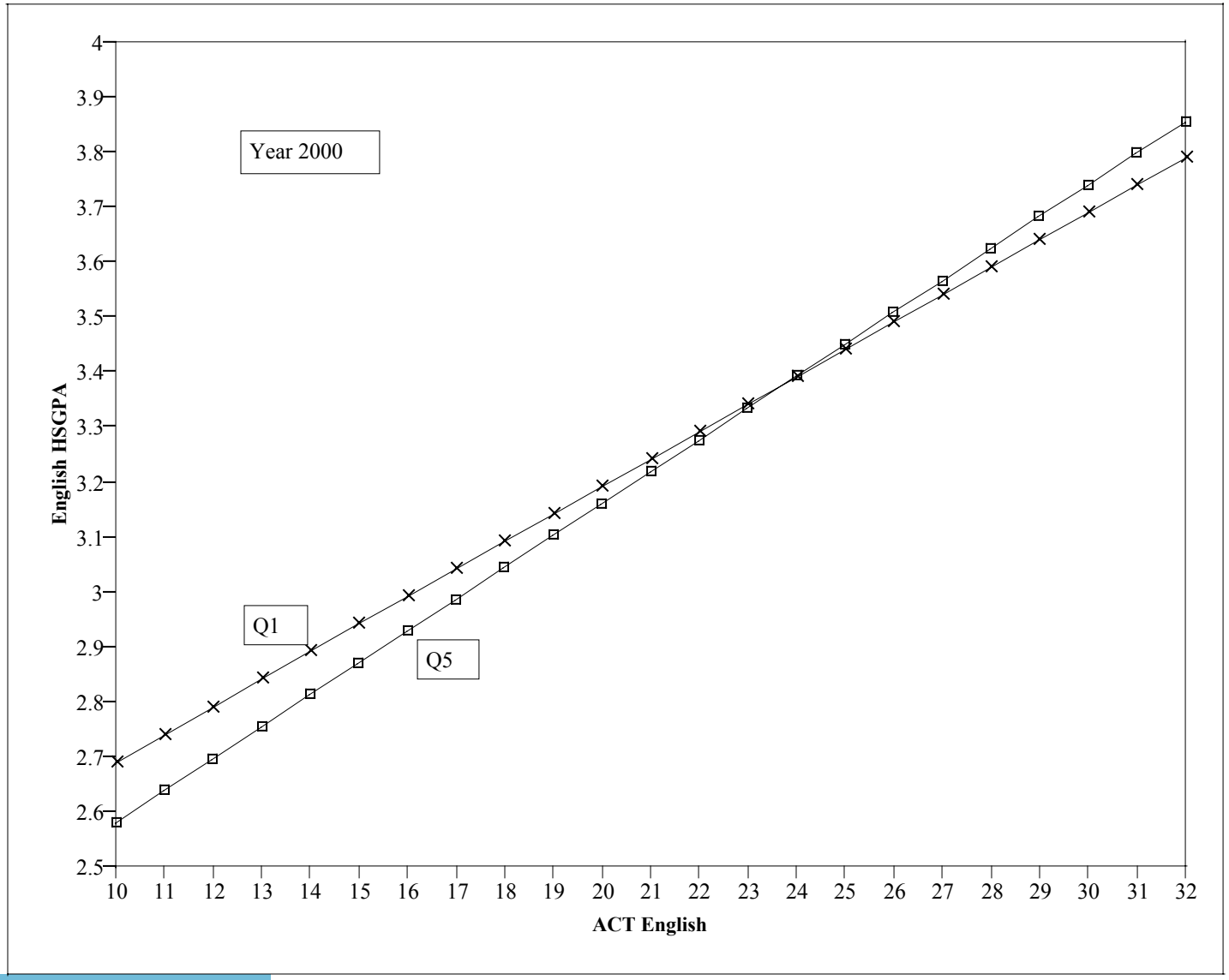
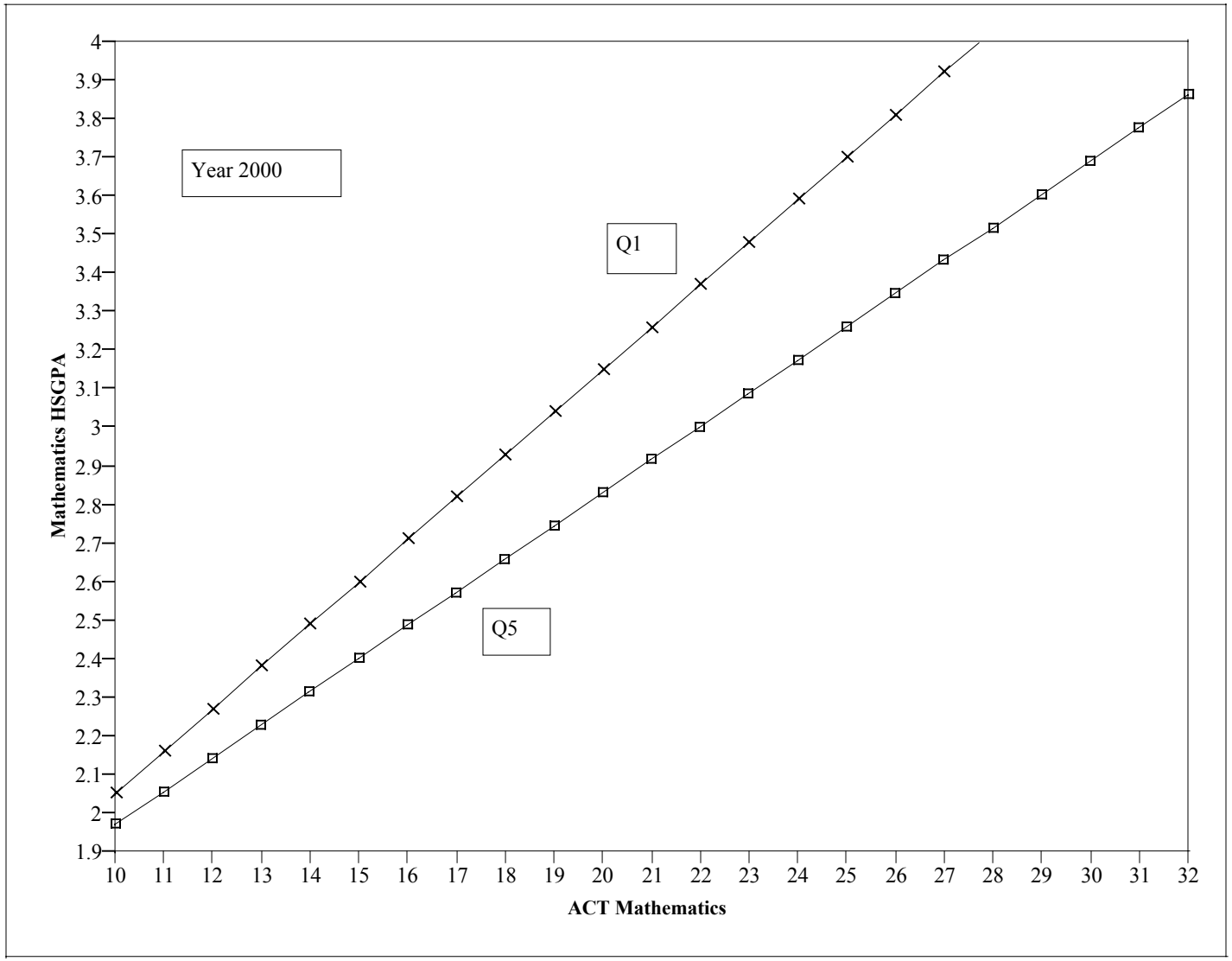


FIGURE 6. Plot of theYear 2000 Linear Regressions of Mathematics HSGPA on ACT Mathematics Score



Comparison of Course Proportions Between Quintiles

Evidence has been presented indicating that schools in the 1st quintile group are using different grading standards than are schools in the 5th quintile group. For the most part students in the 1st quintile group schools are receiving more lenient grades than are students in the 5th quintile group schools. ACT collects course information on 30 different courses when students register to take the ACT. Our HSGPA analyses are based on the grades in 23 of these courses. For the analysis of the overall HSGPA, Table 9 contains the proportion of students who reported having taken the various courses for the 1st and 5th quintile groups for all five years. Information for all 30 courses is given in Table 9, but it is only grades in the first 23 courses that contribute to overall HSGPA. The differences between the 1st and 5th quintile group proportions in all five years also are presented. Table 9 is based on data from the schools used in the analysis of the overall HSGPA. A majority of schools were common to all three HSGPA analyses. The course information for the English HSGPA data and the mathematics HSGPA data are either equal to or nearly identical to the overall HSGPA data. Therefore, course proportions in tabular form are not presented for those two data sets, and analyses of English courses and mathematics courses are based on the data in Table 9.

The ACT is carefully designed to measure the skills and knowledge taught in high school that are necessary for success in college. It is possible that students in the 5th quintile group took more college preparatory courses than students in the 1st quintile group. If the 1st quintile students did not take the appropriate courses needed to do well on the ACT, this could explain their higher mean HSGPA's for the same ACT scores. This does not appear to be the case as will be seen by an examination of Table 9. There are between quintile group differences in the

proportions of students taking various courses. However, they are not extreme enough to account for all of the disparity between the grading standards of the 1st and 5th quintile group schools.

First, note that in the 1st quintile group about 20% of the students took the ACT in their junior year of high school and about 80% took the ACT in their senior year of high school. In the 5th quintile group the split was more even, with about 50% of students taking the ACT in their junior year of high school and 50% in their senior year of high school. On average, the 1st and 5th quintile group students took about the same number of courses, of the 30 listed, at the time of taking the ACT test.

English HSGPA is based on the five English courses listed first in Table 9. More 5th quintile group students took speech, but more 1st quintile group students took twelfth grade English, and the 1st quintile group students have the higher proportion of students taking higher level English courses at the time of ACT testing. It seems unlikely that these course work differences between the 1st and 5th quintile groups would account for the differences in English grading standards between the 1st and 5th quintile groups.

The mathematics HSGPA is based on the next seven courses. Except for algebra 1, a higher proportion of 5th quintile group students took the mathematics courses, but this difference was appreciable only for trigonometry. Of the 60 items on the ACT Mathematics Test, four involve trigonometry. Nonetheless, the 5th quintile group had a greater proportion of students taking higher level mathematics courses. The differences in mathematics courses between the two quintile groups could account for part of the discrepancy between grading standards between the 1st and 5th quintile group schools. However, it seems unlikely that the moderate between quintile group differences in mathematics courses could be the sole cause of the discrepancy.

TABLE 9

For Each of the Five Years the Proportion of Students in Both Quintiles who Have Taken the Listed Courses

YEAR	1998				1999				2000				2001				2002		
Course	Q1	Q5	Q1-Q5		Q1	Q5	Q1-Q5		Q1	Q5	Q1-Q5		Q1	Q5	Q1-Q5		Q1	Q5	Q1-Q5
English 9	0.99	1.00	-0.01		0.99	1.00	-0.01		0.99	1.00	-0.01		0.99	1.00	-0.01		0.99	1.00	-0.01
English 10	0.99	1.00	-0.01		0.99	1.00	-0.01		0.99	1.00	-0.01		0.99	1.00	-0.01		0.99	0.99	0.00
English 11	0.99	0.99	0.00		0.98	0.99	-0.01		0.98	0.99	-0.01		0.98	0.98	0.00		0.98	0.98	0.00
English 12	0.72	0.39	0.33		0.73	0.40	0.33		0.70	0.37	0.33		0.68	0.35	0.33		0.71	0.36	0.35
Speech	0.16	0.32	-0.16		0.18	0.32	-0.14		0.22	0.31	-0.09		0.24	0.32	-0.08		0.26	0.33	-0.07
Algebra 1	0.97	0.96	0.01		0.97	0.96	0.01		0.97	0.96	0.01		0.97	0.96	0.01		0.98	0.96	0.02
Algebra 2	0.80	0.90	-0.10		0.82	0.90	-0.08		0.84	0.90	-0.06		0.85	0.91	-0.06		0.86	0.91	-0.05
Geometry	0.92	0.97	-0.05		0.93	0.96	-0.03		0.94	0.96	-0.02		0.94	0.96	-0.02		0.95	0.96	-0.01
Trigonometry	0.32	0.50	-0.18		0.30	0.49	-0.19		0.30	0.48	-0.18		0.29	0.47	-0.18		0.27	0.47	-0.20
Calculus	0.09	0.11	-0.02		0.09	0.11	-0.02		0.09	0.11	-0.02		0.09	0.11	-0.02		0.10	0.11	-0.01
Advanced Math	0.25	0.32	-0.07		0.26	0.33	-0.07		0.27	0.33	-0.06		0.27	0.33	-0.06		0.29	0.34	-0.05
Computer Sci.	0.13	0.11	0.02		0.12	0.11	0.01		0.11	0.12	-0.01		0.11	0.12	-0.01		0.10	0.12	-0.02
General Sci.	0.76	0.75	0.01		0.76	0.75	0.01		0.76	0.74	0.02		0.78	0.75	0.03		0.79	0.76	0.03
Biology	0.97	0.97	0.00		0.97	0.97	0.00		0.97	0.97	0.00		0.97	0.97	0.00		0.97	0.97	0.00
Chemistry	0.77	0.84	-0.07		0.78	0.84	-0.06		0.79	0.84	-0.05		0.80	0.84	-0.04		0.80	0.84	-0.04
Physics	0.29	0.38	-0.09		0.29	0.38	-0.09		0.29	0.38	-0.09		0.30	0.37	-0.07		0.30	0.37	-0.07
US History	0.98	0.98	0.00		0.97	0.99	-0.02		0.97	0.98	-0.01		0.97	0.98	-0.01		0.97	0.98	-0.01
World History	0.82	0.81	0.01		0.79	0.81	-0.02		0.79	0.81	-0.02		0.81	0.81	0.00		0.81	0.81	0.00
Other History	0.22	0.29	-0.07		0.21	0.28	-0.07		0.20	0.28	-0.08		0.20	0.28	-0.08		0.19	0.28	-0.09
US Government	0.62	0.50	0.12		0.64	0.51	0.13		0.64	0.52	0.12		0.63	0.51	0.12		0.65	0.53	0.12
Economics	0.48	0.28	0.20		0.48	0.28	0.20		0.50	0.29	0.21		0.48	0.28	0.20		0.50	0.29	0.21
Geography	0.48	0.35	0.13		0.50	0.36	0.14		0.53	0.36	0.17		0.53	0.36	0.17		0.54	0.36	0.18
Psychology	0.14	0.23	-0.09		0.14	0.24	-0.10		0.15	0.23	-0.08		0.15	0.23	-0.08		0.16	0.24	-0.08
Spanish	0.64	0.65	-0.01		0.65	0.65	0.00		0.66	0.66	0.00		0.67	0.65	0.02		0.67	0.65	0.02
French	0.23	0.21	0.02		0.23	0.20	0.03		0.24	0.20	0.04		0.24	0.21	0.03		0.23	0.21	0.02
German	0.02	0.10	-0.08		0.02	0.10	-0.08		0.02	0.10	-0.08		0.02	0.10	-0.08		0.02	0.10	-0.08
Other Lang.	0.06	0.09	-0.03		0.06	0.09	-0.03		0.06	0.09	-0.03		0.06	0.09	-0.03		0.06	0.10	-0.04
Art	0.46	0.47	-0.01		0.49	0.48	0.01		0.50	0.48	0.02		0.50	0.48	0.02		0.52	0.49	0.03
Music	0.41	0.42	-0.01		0.42	0.42	0.00		0.43	0.43	0.00		0.42	0.43	-0.01		0.42	0.44	-0.02
Drama	0.13	0.15	-0.02		0.15	0.15	0.00		0.15	0.15	0.00		0.16	0.16	0.00		0.17	0.16	0.01

The other two ACT tests that contribute to the Composite score are Science and Reading. The Reading test contains passages on a wide variety of topics but does not require specific knowledge from a specific course. The 5th quintile group has an equal or slightly higher proportion of students taking the four science courses that are listed after the mathematics courses in Table 9. Three more courses have consistent differences in proportions; they are Economics, US Government, and Geography. More 1st quintile group students took these courses than did 5th quintile group students with about 20% more taking Economics, 16% more taking Geography, and 12% more taking US Government. There are other smaller between quintile group differences in the proportion of students taking various courses. When considering all courses combined, the 1st quintile group has the advantage in a few courses, but the 5th quintile group has the advantage in most courses. However, the between quintile group differences in courses do *not* appear large enough to contradict the conclusion that the schools in the 1st quintile group are using more lenient grading standards in all courses in general.

Discussion

Given that the ACT is an objective standard of achievement applied equally to all students in all high schools, the results of this study indicate that different high schools do use different grading standards. The two groups of schools used in the study had average ACT scores at the upper and lower extremes, so the differences in grading standards documented in this study also are the most extreme. It is expected that grading standards would vary continuously among the schools between the two extreme groups of schools studied in this report. That was the result found in the study by Ziomek & Svec (1995) cited earlier.

The results of this study imply that grades are more of a relative standard, in that they can vary from school to school. It appears that a student's grades depend not only on the student's

achievements but also on the achievement of the student's schoolmates, and different schools can have student populations with different average levels of achievement. ACT scores, in contrast, have the same meaning at all schools. In this sense, grades are norm-referenced within schools, and the ACT is criterion-referenced across schools. This difference between high school grades and the ACT is one characteristic of the ACT that makes it a good adjunct to high school grades in selecting students for college.

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