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High School Students and Their Lack of Preparedness for College: A Statewide Study

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Abstract

In this study, the authors examined the college-ready graduate rates of all students (n = 1,099 high schools) in the State of Texas for the 2006-2007 school year. Data were analyzed for students' scores in reading, in math, and in both subject areas combined. Approximately one-third of all students were determined to be college-ready in both subject areas. Statistically significant and practically relevant differences, reflecting moderate to large effect sizes, were present in reading, math, and both subjects among Hispanic, African American, and White students. Concerns are expressed about the lack of preparedness of students for college and about the presence of strong achievement differences as a function of ethnicity. Implications of these findings are discussed.

Keywords

Students, schools, school improvement

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Careers of the 21st century now require some form of postsecondary education. More specifically, Dohm and Shniper (2007) reported that 73% of the fastest growing occupations require some form of postsecondary education or training. College-ready students are more likely to be prepared for postsecondary education and the workforce (Cline, Bissell, Hafner, & Katz, 2007) and to be ready to participate in the social and political aspects of citizenship (Dougherty, Mellor, & Smith, 2006) than are students who are not college-ready.

Furthermore, an economic benefit exists to the individual and to the public when students are adequately prepared for college (Merisotis & Phipps, 2000). Unless students qualify for financial aid, they and their parents may face an additional burden as they may have to pay for courses for which they do not get credit. According, students may then require more semesters in which to graduate. Moreover, across the nation in both 2-year and 4-year institutions of higher education the likelihood exists that some students regardless of ethnicity or economic status who take one or more developmental courses may not graduate (Bettinger & Long, 2004; Deil-Amen & Rosenbaum, 2002; Merisotis & Phipps, 2000; National Center for Education Statistics [NCES], 2004) and may experience a lower income related to not completing an undergraduate degree. Furthermore, a loss of financial benefit exists to the community when students who start college do not finish and earn their degrees (Merisotis & Phipps, 2000).

Yet, many high school graduates fall short of being prepared to be successful in postsecondary education. Green and Forester (2003) stated:

> More than half of the students who do graduate from high school, and more than two-thirds of all the students who start high school, do not graduate with the minimal requirements needed to apply to a four-year college or university. (p. 1)

In the state of Texas, for example, "the majority of Texas high school students do not graduate prepared for postsecondary education or training" (American Diploma Project Network [ADPN], 2006, p. 2). More recently, Tresaugue (2008) reported on the new College Readiness Standards and suggested that many of the students graduating from Texas high schools are not adequately prepared for college and must take remedial courses for no credit. With the reporting of so many students graduating who are not prepared for college-level work, and with the connection between degree completion and individual and societal benefits, it is important to learn as much as possible about these students. Tresaugue's report, however, was descriptive and offered no comparison of student subgroups. Therefore, this study was undertaken to

determine the extent to which students who graduated from Texas high schools in 2007 were college-ready, and to determine if significant differences existed among these various subgroups.

We chose to study Texas for several reasons. First, Texas is the second most populous state in the United States (U. S. Census Bureau, 2007). Second, Texas has a "large proportion of underserved minority students" (College Board, 2007, p. 11), and Murdock et al. (2002) projected that by 2,040 the number of students in Texas public schools and universities will increase, and the majority of the students will be non-Anglos. Third, through the Texas Education Agency (TEA), the Academic Excellence Indicator System (AEIS) reports provided large databases on all the schools in Texas, and, therefore, we gained access to a large sample of school and district data. Texas is a participating state in the ADPN, a group of states that are working to ensure all high school graduates are ready for college-level work. Finally, Texas is one of several states requiring the implementation of higher college-readiness standards (CRS).

Review of the Related Literature

What is College Readiness?

Discussions about college preparation do not represent a new concept. For example, more than 60 years ago, McConnell (1947) reported on the five committees of the *Conference on the Education of Youth in America*, held at Teachers College, November of 1946. In his report he explained that the mission of the committees was to develop "policy for American secondary and college education that would characterize in broad terms the type of schooling" (¶ 2) for all students whether they were college bound or not. In the second part of the report, Cushman (1947) reported that the college-preparatory curriculum also served students who were not going to attend college. Moreover, Cushman added that the primary purpose of secondary education should not be to prepare all students for going to college. This point of view contrasts with the more recent calls to design rigorous high school curricula aligned with postsecondary expectations necessary to prepare students for postsecondary education or the work force (American College Testing [ACT], 2007; Conley, 2003; Dougherty et al., 2006; Kuh, Kinzie, Buckley, Bridges, & Hayek, 2006).

What is college readiness? College readiness is defined by the ACT (2007) as "the level of preparation a student needs to enroll and succeed—without remediation—in a credit-bearing general education course at 2-year or 4-year

institution, trade school, or technical school" (p. 5). Conley (2007b) defined college readiness much the same way but limited his definition to a "postsecondary institution that offers a baccalaureate degree or transfer to a baccalaureate program" (p. 5). Conley further suggested that a successful student under this definition is ready—with requisite skill, knowledge, and understanding—to be successful in additional courses. However, even though college preparation is a part of most high school curricula in the United States today, many students who apply for college admission must take remedial courses because they are not adequately prepared for the rigors of college (Education Trust, 2001). In other words, they are not college-ready.

Attewell, Lavin, Domina, and Levey (2006) indicated that "40% of traditional undergraduates take at least one [remedial] course" (p. 886). Remedial courses are intended to help students improve or develop skills necessary for college-level work. Unfortunately, a large proportion of students enrolled in remedial classes are students from economically disadvantaged backgrounds, students who speak a language other than English, and students of color (Attewell et al., 2006). Bettinger and Long (2004) found that these students often drop out and, therefore, never graduate. However, it is important to note that White students and students from upper economic backgrounds also are represented in these remedial classes.

Several researchers have linked remedial or developmental education to students not obtaining a college degree. For example, Adelman (1999, 2004) found that students who take at least one remedial course are not as likely to graduate with a bachelor's degree as are those students who do not take remedial courses. This likelihood is even greater for those students who take more than one remedial course.

Findings such as these have prompted private organizations (e.g., Achieve, Inc., National Center for Educational Accountability, ACT) and many state legislatures to call for more rigorous standards and increased graduation requirements for all students (Conley, 2007b). Dougherty et al. (2006) discussed the need for CRS for all students. They urged schools to begin working on these CRS absent any state efforts to do so, but they warned against setting the standards too high. The ACT (2007) suggested that local standards should align with state standards, and these standards should be aligned with the postsecondary expectations (Conley, 2003). However, Achieve, Inc. (2007a) claimed that most states have academic standards, but many students do not get the academic rigor necessary to be successful after graduation. Therefore, Achieve, Inc. has a goal to "help every state close the expectations gap so that all students graduate ready for success" (¶ 2). Part of this work is being

completed through the ADPN as Achieve, Inc. works with groups in 33 states "to significantly raise the rigor of the high school standards, assessments and curriculum and to better align these expectations with the demands of post-secondary education and work" (Achieve, Inc., 2007b, ¶ 2). This work is an extension of the ADP, a collaborative effort of Achieve, Inc., The Education Trust, and The Fordham Foundation.

College Readiness in Texas

College readiness has been associated with student scores on the Scholastic Aptitude Test (SAT) or ACT exam because colleges have used these scores as part of the selection process. Beginning in 2006, Texas performance reports, called the AEIS, included college readiness indicators in response to "a new statute (Texas Education CODE [TEC] §39.051(b)(13)) that requires establishing an indicator of "the measure of progress toward preparation for postsecondary success'" (TEA, 2007, p. 9). These indicators include: (a) Advanced course/dual enrollment completion, (b) Recommended high school program/distinguished achievement program graduates, (c) Advanced Placement/International Baccalaureate (AP/IB) Results, (d) Texas Success Initiative (TSI) Higher Education Readiness Component, (e) SAT/ACT Results, and (f) College-ready graduates. The advanced course/dual enrollment course rating is based on students completing at least one advanced course sometime during Grades 9 to 12. Dual enrollment refers to students enrolled in courses in which they receive both high school and college credit. Results for AP/IB courses are based on the students who complete the exams, who receive Advanced Placement credit, or who both complete the exams and receive AP credit. According to the policies of the higher education institution, students are awarded credit for scores 3, 4, or 5 on AP exams or 4, 5, 6, or 7 on the IB examination. Under TSI, students are required to take assessments of reading, writing, and mathematics to see if they are ready for college work; however, students may be exempted from these assessments if they have a sufficiently high score on the Texas Assessment of Knowledge and Skills (TAKS) exit-level test, the SAT, or the ACT. Results for SAT/ACT examinations also are included as an indicator. Finally, a college-ready graduate is one who "met or exceeded the college-ready criteria on the TAKS exit-level test, or the SAT test, or the ACT test" (p. 9). Students can be deemed college-ready in English Language Arts or math based on three possible examinations: state administered exit-level exam, the SAT, or the ACT. See Table 1 for AEIS college-ready criteria.

Table 1. Texas AEIS Criteria for High School Students to Be Deemed a College-Ready Graduate

Subject	Exit-Level TAKS		SAT		ACT
ELA	≥ 2,200 scale score and ≥ 3 essay	or	≥ 500 on Critical Reading and ≥ 1070 Total	or	≥ 19 on English and ≥ 23 Composite
Math	≥ 2,200 scale score	or	≥500 on Math ≥ 1070 Total	or	≥19 on Math and ≥ 23 Composite

Specifically, for the exit-level English Language Arts examination, students must earn a scale score of 2,200. The criteria for the SAT are a score of 500 or higher on the SAT Critical Reading and a 1,070 or higher total SAT score. The criteria for the ACT are a score of 19 or higher on English and a composite score of 23 or more. For the Math exit-level TAKS examination, students must earn a scale score of 2,200. The criteria for the SAT are a score of 500 or higher on the SAT Math and a 1,070 or higher total SAT score. The criteria for the ACT are a score of 19 or higher on Math and a composite score of 23 or more. Students who meet these criteria are exempt from the state-mandated testing under the TSI, and students who do not meet these criteria must complete the TSI to qualify for college entrance.

Other substantial changes are in place to address college readiness. Ninth-grade students entering during the 2007-2008 school year are required to take four courses in English, mathematics, science, and social studies to graduate. This plan is called the 4 × 4 plan (Texas Administrative Code [TAC], 19, §74.63). Students currently in Grades 10 through 12 were under a different plan and thus were not required to take 4 years of science and social studies. The 79th Legislative Session (third recall session) was used to put into place House Bill (HB) 1, which called for the establishment of vertical teams (VTs) of public school and higher education faculty to evaluate high school curriculum content for rigor and alignment to CRS. In addition, the VTs were to establish the support, resources, and professional development for teachers so they are better able to assist students needing additional assistance in preparing for college-level work.

In 2007, the draft of the CRS was approved by the Texas Higher Education Coordinating Board (THECB). These standards will be used to help school districts, students, parents, and teacher to know what students must be expected to demonstrate upon entering college. The CRS are not necessarily

aligned to Texas Essential Knowledge and Skills (TEKS) used for the purpose of guiding curriculum and state testing.

Research Questions

The following research questions were addressed in this study:

1. What are the college-ready graduate rates of all students in reading, in math, and in both subjects for all students in traditional high schools in the State of Texas?
2. What are the college-ready graduate rates of Hispanic students in reading, in math, and in both subjects in traditional high schools in the State of Texas?
3. What are the college-ready graduate rates of African American students in reading, in math, and in both subjects in traditional high schools in the State of Texas?
4. What are the college-ready graduate rates of White students in reading, in math, and in both subjects for all students in traditional high schools in the State of Texas?
5. What is the difference in college-ready graduate rates in reading in traditional high schools as a function of ethnic membership in the State of Texas?
6. What is the difference in college-ready graduate rates in math in traditional high schools as a function of ethnic membership in the State of Texas?
7. What is the difference in college-ready graduate rates in both subjects in traditional high schools as a function of ethnic membership in the State of Texas?

Method

Participants

Data from all public school high school campuses in the State of Texas for the 2006-2007 school year were utilized in this study. The aforementioned research questions were examined either for all students or for the designated ethnic group (i.e., Hispanic, African American, White) and for all students. Collected annually by the TEA are educational data from more than 1,200 school districts and almost 8,000 school campuses. These data are available and downloadable at the AEIS through the TEA website (TEA, 2007).

Procedures

Data were downloaded from the Texas Education Agency's Academic Excellence Indicator System website. The AEIS database provides a broad range of information on the performance of students in each school and district in Texas yearly. Of specific interest to the researchers in this study were recently released data on college-preparedness. Specifically, the State of Texas through the AEIS database provides information on the percentage of students by high school campus who are deemed to be college-ready in reading, in math, and in both subject areas. These percentages are disaggregated by ethnic membership, gender, special education, low-income status, and limited proficiency status (TEA, 2007). In addition, the database contains information on district schools and staff, finances, and student demographics.

The researchers began by selecting the 2006-2007 school year, all of the school campus files (approximately 8,000) for the State of Texas, and variables to be examined (i.e., college-readiness graduate rate variables, school campus level, school identifier) from the AEIS website. Because the data are organized on the AEIS website as separate data files, the variables of interest were selected from three separate AEIS data files and saved as Data (*.dat) files. Then, the data files were merged, using the school campus identifier as the linking variable, into an SPSS database and analyzed. Before statistical analysis, all schools not identified as high schools were eliminated from analysis. Then, of the remaining schools, all charter and alternative high schools were removed from the database. These schools were removed from this study because of the wide variability of curricula, school structures, grade levels, and student diversity, thus, permitting a clear focus on students' scores at traditional high schools. Because of our focus on traditionally structured high schools, our descriptive statistics differ from the statistics available to readers through the press (e.g., Hacker, 2008; Tresaugue, 2008). The press releases available to the public include student performance from all high schools in the state, including charter and alternative high schools.

Readers will note that the number of high schools on which data are present for each statistical analysis varies. These differences in sample sizes are a direct reflection of the manner in which TEA reports data. When data are reported by subgroup, a sufficient number (i.e., at least 5) of students within each subgroup must have scores present at each campus for their scores as a subgroup to be posted. Thus, when analyzing data by subgroup, not every high school campus in the State of Texas has an adequate number of students within each subgroup to have subgroup scores provided in the AEIS database.

Table 2. Descriptive Statistics for College-Ready Graduate Rates for Students in the State of Texas for the 2006-2007 School Year

College-Ready Graduates	*n*	*M*	*SD*
Reading			
White	982	53.21	17.08
Hispanic	859	37.04	17.64
African American	537	33.97	17.45
All students	1,099	44.76	16.84
Math			
White	980	58.72	15.14
Hispanic	865	39.73	15.84
African American	539	29.15	16.24
All students	1,099	48.16	15.73
Both subjects			
White	980	40.73	16.17
Hispanic	857	22.26	14.48
African American	535	17.20	14.04
All students	1,099	31.11	15.31

Results

Descriptive statistics were calculated so that the first four research questions could be addressed. Regarding the college-ready graduate rates of all students in reading, Table 2 indicates that of the 1,099 high school campuses from which data were available, 44.76% of high school seniors were college-ready graduates in reading. A higher percentage, 48.16%, was present for the college-ready graduate variable of math. To determine whether the percentages of students who were college-ready in reading and in math differed, we conducted a dependent samples *t*-test which revealed that this difference in percentages was statistically significant, $t(1{,}098) = 8.24$, $p < .0001$. The effect size for this difference was .20, indicating a small effect size (Cohen, 1988). For each individual subject area, less than one-half of the State of Texas' graduating seniors for the 2006-2007 school year were deemed to be college-ready. When the percentage of college-ready graduates in both subject areas was examined, this percentage was 31.11% of all students. Thus, less than one-third of Texas graduating seniors in the 2006-2007 school year were determined to be college-ready in both reading and math.

Concerning the college-ready graduate rates of Hispanic students in reading, Table 2 indicates that of the 859 high school campuses from which data were available on Hispanic students, 37.04% of high school Hispanic seniors

were college-ready graduates in reading. A higher percentage, 39.73%, was present for the college-ready graduate variable of math for Hispanic students. To ascertain whether the percentages of Hispanic students who were college-ready in reading and in math differed, we conducted a dependent samples *t*-test which revealed that this percentage difference was statistically significant, $t(857) = 4.66$, $p < .001$, with an effect size of .17 or small (Cohen, 1988). For each individual subject area, only a little more than one-third of the State of Texas' graduating Hispanic seniors for the 2006-2007 school year were deemed to be college-ready. When the percentage of college-ready graduates in both subject areas was examined, this percentage was 22.26% of Hispanic students. Thus, only slightly more than one-fifth of Texas graduating Hispanic students in the 2006-2007 school year were determined to be college-ready in both reading and math.

For the third research question in which the college-ready graduate rates of African American students were of interest, Table 2 shows that of the 537 high school campuses from which data were available on African American students, 33.97% of high school African American seniors were college-ready graduates in reading. A lower percentage, 29.15%, was present for the college-ready graduate variable of math for African American students. To determine whether the percentages of African American students who were college-ready in reading and in math differed, we conducted a dependent samples *t*-test which revealed that this percentage difference was statistically significant, $t(534) = 7.36$, $p < .001$. The effect size for this finding was .29, or small (Cohen, 1988). For each individual subject area, only one-third or fewer of the State of Texas' graduating African American seniors for the 2006-2007 school year were deemed to be college-ready. When the percentage of college-ready graduates in both subject areas was examined, this percentage was 17.20% of African American students. Thus, less than one-fifth of Texas graduating African American students in the 2006-2007 school year were determined to be college-ready in both reading and math.

In the fourth descriptive research question, interest was placed in the college-ready graduate rates of White students. Depicted in Table 2 are the number of high school campuses from which data were available ($n = 982$) and the percentage of college-ready graduates. More than one-half, 53.21%, of White students were reported to be college-ready graduates in reading. A higher percentage, 58.72%, was present for the college-ready graduate variable of math for White students. Another dependent samples *t*-test revealed that this difference in percentages was statistically significant, $t(979) = 11.12$, $p < .0001$. The effect size for this difference was .34, or moderate (Cohen, 1988). For each individual subject area, only slightly more than one-half of

the State of Texas' graduating White students for the 2006-2007 school year were deemed to be college-ready. When the percentage of college-ready graduates in both subject areas was examined, this percentage was 40.73% of White students. Thus, less than one-half of Texas graduating White students in the 2006-2007 school year were determined to be college-ready in both reading and math.

Before running inferential statistical procedures so that the next three research questions could be addressed, the college-ready variables were checked to determine the extent to which their skewness and kurtosis values were within normal limits (i.e., +/− 3 for standardized skewness [skewness divided by its standard error] and standardized kurtosis [kurtosis divided by its standard error]). Of the 18 possible standardized skewness and kurtosis coefficients for the college-ready graduates variables (i.e., reading, math, and both subjects) for Hispanic students, for African American students, and for White students, 15 coefficients were outside the range of normality. Thus, the data we analyzed in this study did not fit the assumptions underlying a normal distribution (Onwuegbuzie & Daniel, 2002). These assumptions include, but are not limited to, the mean and median being the centerpoint of the distribution wherein 50% of the cases are at and/or above this centerpoint. In all of the variables analyzed herein, this assumption was violated. The mean was markedly different from the median. When data are heavily skewed, the percentages of persons lying between the mean and each standard deviation differ from the percentages specified in normal distributions. Thus, parametric statistics, which rely upon the assumptions of a normal distribution, were not appropriate for the AP data analyzed in this study. Because of these severe violations of normality, nonparametric procedures were utilized (Onwuegbuzie & Daniel, 2002). Specifically, a nonparametric Friedman's related samples test (Huck, 2007) was utilized to address the inferential research questions.

To correct for multiple uses of the Friedman's related samples test, the Bonferroni method of adjustment was used such that the total experimentwise error remained at .05. With three statistical tests conducted, the resulting level of statistical significance was .0167 (i.e., .05 divided by 3). As stated previously, readers also should note that the numbers of school campuses varied across the statistical procedures due to the manner in which the AEIS data are reported on the TEA website. School campuses that do not have a minimum number of students (i.e., at least 5) in subgroups such as Hispanic and African American do not report scores in those categories. Thus, high school campuses might have data on one subgroup, on two subgroups, or on all three subgroups. For the statistical analyses in which the Friedman related samples test was utilized, only high schools in which all three sets of scores

were present were included in the analysis. Thus, listwise deletion was used (i.e., deleting the entire case when missing data are evidenced). However, when data are not missing completely at random and less than 30% of data are missing—as was very much the case in the present investigation—listwise deletion yields less biased parameter estimates than do other common imputation methods (Kromrey & Hines, 1994).

We would have preferred to have conducted a more sophisticated level of statistical analysis than separate univariate procedures. Unfortunately, in our view, the State of Texas reports college-readiness data in terms of student demographic characteristics. That is, college-readiness rates in reading and in math are reported separately for each ethnic group and by gender. Thus, demographic characteristics are inextricably linked with the readiness rates. As such, the method by which Texas reports achievement data differs from the ways in which most researchers gather data. The typical means of gathering data is to have separate variables for demographic characteristics and for dependent variables. That is, a categorical variable would be present for ethnicity and a separate one would be present for gender. Test score data would be generated as separate dependent variables. Because Texas data mixes the demographic characteristic with achievement data, multivariate analytic procedures, which requires that the two factors be separated, are not possible. Further, because the univariate normality assumption was not met, the multivariate normality assumption was not met (Tabachnik & Fidell, 2006)—rendering parametric multivariate statistical procedures inappropriate. Thus, were the demographic characteristics separated from the college-readiness rates, nonparametric multivariate statistical procedures would have to have been employed (Qiu & Hawkins, 2003).

In the initial Friedman test, the percentage of college-ready graduates in reading was compared among Hispanic students, African American students, and White students. This analysis yielded a statistically significant result, ($X^2[2] = 442.11$, $p < .001$, $n = 432$). The effect size for this difference was .51, a moderate effect size (Cohen, 1988). Follow-up pairwise paired samples *t*-tests (i.e., Wilcoxon Signed Ranks Test) were performed to determine which pairs of groups differed from each other. White students ($M = 56.22$, $SD = 16.40$) had the highest percentage of college-ready graduates in reading, followed by Hispanic students ($M = 39.73$, $SD = 17.12$). The lowest percentage of college-ready graduates in reading was for African American students ($M = 35.60$, $SD = 16.54$). White students had more than one-and-a half times the percentage of college-ready graduates in reading than did African American students ($z = 17.67$, $p < .0001$) and almost 40% more college-ready graduates in reading than did Hispanic students ($z = 19.97$, $p < .0001$). Hispanic

students had approximately 10% more college-ready graduates in reading than did African American students ($z = 5.22$, $p < .0001$). The effect size for the White-African American difference was 1.11 and the effect size for the White-Hispanic difference was 0.93, both large effect sizes (Cohen, 1988). The effect size for the Hispanic-African American difference was 0.18, or small (Cohen, 1988). The observed differences that were present in the rates of college-ready graduates in reading among Hispanic, African American, and White students were strong and practically very relevant.

In the second Friedman test, the percentage of college-ready graduates in math was compared among Hispanic students, African American students, and White students. This analysis yielded a statistically significant result ($X^2[2] = 619.32$, $p < .001$, $n = 433$). The effect size for this difference was .72, representing a large effect size (Cohen, 1988). Follow-up pairwise paired samples t-tests (i.e., Wilcoxon Signed Ranks Test) were performed to determine which pairs of groups differed from each other. White students ($M = 62.05$, $SD = 14.10$) had the highest percentage of college-ready graduates in math, followed by Hispanic students ($M = 42.23$, $SD = 14.83$). The lowest percentage of college-ready graduates in math was for African American students ($M = 30.97$, $SD = 15.48$). White students had more than twice the percentage of college-ready graduates in math than did African American students ($z = 18.98$, $p < .0001$) and almost 50% more college-ready graduates in math as did Hispanic students ($z = 21.92$, $p < .0001$). Hispanic students had a one-third greater percentage of college-ready graduates in math than did African American students ($z = 14.49$, $p < .0001$). The effect size for the White-African American difference was 1.88, the effect size for the White-Hispanic difference was 1.22, and the effect size for the Hispanic-African American difference was 0.66. All three of these pairwise differences resulted in large effect sizes (Cohen, 1988).The observed differences that were present in the rates of college-ready graduates in math among Hispanic, African American, and White students were very strong and practically relevant.

In the third and final Friedman test, the percentage of college-ready graduates in both subjects was compared among Hispanic students, African American students, and White students. This analysis yielded a statistically significant result ($X^2[2] = 567.56$, $p < .001$, $n = 429$). The effect size for this difference was .66, a large effect size (Cohen, 1988). Follow-up pairwise paired samples t-tests (i.e., Wilcoxon Signed Ranks Test) were performed to determine which pairs of groups differed from each other. White students ($M = 44.43$, $SD = 16.21$) had the highest percentage of college-ready graduates in both subjects, followed by Hispanic students ($M = 24.74$, $SD = 14.76$). The lowest percentage of college-ready graduates in both subjects was for African

American students ($M = 18.62$, $SD = 13.79$). White students had more than twice the percentage of college-ready graduates in both subjects than did African American students ($z = 18.52$, $p < .0001$) and almost twice the percentage of college-ready graduates in both subjects as did Hispanic students ($z = 21.98$, $p < .0001$). Hispanic students had one-third greater percentage of college-ready graduates in both subjects than did African American students ($z = 9.88$, $p < .0001$). The White-African American and the White-Hispanic differences yielded effect sizes of 1.56 and 1.20, respectively, both very large effect sizes (Cohen, 1988). The effect size for the Hispanic-African American difference was 0.36 or moderate (Cohen, 1988).The observed differences in the college-ready graduates in both subjects among Hispanic, African American, and White students were large in magnitude and have practical relevance to school policy and practice.

Discussion

Legislators, colleges and universities, the THECB, and school districts must work together to assure high school experiences appropriately reflect CRS. In Texas, AEIS data indicate how well high school students demonstrate readiness for college as determined by several indicators. One of these is the college-ready graduate indicator. The college-ready graduate indicator (see Table 1) was reported for the first time in the 2006-2007 AEIS reports. This study represents an initial opportunity to analyze these data for all schools in Texas.

We collected data for traditional high schools and eliminated charter school and alternative high school data. Therefore, the data reported in this study vary slightly from the state AEIS report in which data from all high schools were summarized. The data were analyzed to determine the college-ready graduate rates for all students and for each ethnic subgroup in reading, in math, and in both subjects. We also analyzed data to determine differences in college-ready graduation rates in reading, in math, and in both subjects as a function of ethnic membership. Data from this study might be used as baseline data for future studies.

During the 2006-2007 school year, less than one-third of all high school graduates were college-ready in reading and math. This finding is somewhat congruent with reports in Texas newspapers that more than one-half of graduating seniors were not prepared for college-level work (Hacker, 2008; Tresaugue, 2008). These reports were simply descriptions of state-reported data rather than inferential statistical analyses of differences between and among subgroups of students. That is, in no reports were analyses conducted to ascertain whether the apparent differences were statistically significant or even

practically significant. When examining college-ready status for the ethnic subgroups, slightly more than one-fifth of Hispanic high school seniors were college-ready graduates in both reading and math. Moreover, less than one-fifth of graduating African American seniors were college-ready in both reading and math. Finally, less than one-half of graduating White students were determined to be college-ready in both math and reading. Similar results were found for each subgroup on the individual tests.

We also analyzed the data to determine if differences were present in college-ready graduate status in reading, in math, and in both tests as a function of ethnic membership. Statistically significant differences were found in college-ready status among the ethnic subgroups in both reading and math. Specifically, Whites scored higher in both subjects than did Hispanic students, and Hispanic students scored higher than did African American students. These same differences in college-ready graduates were found in reading and in math. Almost all of these differences yielded large effect sizes.

Even though the African American and Hispanic students attained lower college-readiness rates than did their white counterparts, this does not imply that the African American and Hispanic students have performance deficits that are innate. Indeed, the ethnic differences documented in this investigation likely reflect the marginal resources of public schools attended by the vast majority of minority students, as well as the racialized politics and practices of local, state, and federal governments (e.g., Donovan & Cross, 2002; Hacker, 1992; Kozol, 2005; Kunjufu, 1990, 1997). Research also has indicated that African American and Hispanic students are frequently tracked in less rigorous courses and have the least qualified teachers (Contreras, 2005; Darling-Hammond, 2004), both of which may negatively impact standardized test performance and college readiness.

Thus, current educational policies need to be re-examined, especially as they affect the college-readiness rates of high school students. In any case, comparing the academic performance levels of African American and Hispanic high school students to White students or students of other ethnicities does not represent inappropriate practice per se, as long as findings are interpreted responsibly and ethically. Such studies of between-group differences can yield useful information. Nevertheless, studies also are needed that examine *within-group* differences. For example, a useful line of research would be to compare the college-readiness rates of African-American males and females and Hispanic males and females from the same family because gender and ethnicity often interact with respect to educational outcomes (Heath, 1992). In fact, useful information can be gleaned concerning the learning experiences of minority students by examining within-ethnic differences (see

for example, Casteel, 1995; Onwuegbuzie, 1997). This information can then be used to inform intervention strategies to enhance the college preparedness of minority students.

More than one-half of the jobs of the future will require some postsecondary education (Dohm & Shniper, 2007). Based on our findings in this study, it appears that large numbers of recent high school graduates are not prepared to take college-level courses, and thus these students may be required to take remedial or developmental courses during their first year of college. These developmental courses may serve as a barrier to completing a degree program for some students, especially for those students who must take more than one such course (Bettinger & Long, 2004; Deil-Amen & Rosenbaum, 2002; Merisotis & Phipps, 2000).

These findings also support the efforts in progress at the state level to create CRS that align with the standards of institutions of higher education. As high schools begin to align their curricula, instruction, and assessments to CRS, and as students begin taking more rigorous courses, it is anticipated that future reports of college-ready graduates will improve. For example, application of some of these standards began with the Grade 9 students of 2006-2007 and the 4 × 4 plan. Potentially, several years may be needed to see significantly improved college-ready scores in reading and in math. However, school leaders and legislators should consider the long-term effects of these higher standards. In the short-term the CRS may have an opposite effect by increasing the number of students who fail to attain the standards (Dougherty et al., 2006).

The increased failure to attain the higher standards may be particularly evident in minority students. Although high expectations and access to relevant and college-preparatory courses have been shown to be predictors of academic achievement and college-going among African Americans and Hispanics (Contreras, 2005), low or failing grades and failed high school exit examinations have been cited as predictors of high school dropout. Thus, African American and Hispanic students are more vulnerable to dropping out of high school than are White students (Kiagas, 2003).

In the meantime, schools can take actions to improve the numbers of college-ready graduates in the areas of teacher professional development and special program implementation. Teachers need to receive professional development in instructional strategies that help them develop college-readiness skills in students. Training might focus on teaching strategies that develop students' critical and analytical thinking and their ability to draw inferences and conclusions, conduct research, and effectively communicate orally and in writing. Instructional strategies and interventions are essential to students

at-risk of not being prepared for college-level work. In addition, improved instructional resources must be made available for teachers.

Programs and support services must be in place to assist students at-risk so these students can receive the extra help they need. According to Kuh et al. (2006), programs might include "orientation, transition courses and first-year seminars, learning communities, intrusive advising, tutoring, supplemental instruction, peer tutoring, study groups and summer bridge programs, study skills workshops, mentoring and student support groups, student-faculty research, and senior capstone projects" (p. 57).

In addition to professional development, instructional resources, and programs for students, schools and districts need to establish working relationships with local universities and colleges. Olson (2006), in an *Education Week* article, implied the importance of this dialogue between secondary and postsecondary institutions by stating:

> [T]he United States has more than 4,200 postsecondary institutions ranging from two-year colleges with few admission requirements to elite research universities that accept a small fraction of candidates. Yet, few people identify what types of schools they're talking about when they use the phrase "college-ready."

Continuous dialogue between high schools and higher education institutions may assist schools in defining their programs and instructional goals as they relate to the requirements of various colleges (Conley, 2007a; Tierney, 2004).

We suggest that additional research be conducted related to college-readiness issues. First, our research should be replicated each year when the AEIS reports are made available to check for improvements and trends. Researchers could analyze the significance of the other indicators of college-readiness: AP/IB completion, Recommended High School Program/Distinguished Academic Programs, SAT and ACT results, and TSI. Moreover, based on the findings of Tierney (2004), a complete "focus on only academic skills is insufficient" (p. 959), and researchers should look at other factors that may impact college readiness for African American and Hispanic students (e.g., cultural background factors, social/emotional factors, family influence factors; Byrd & McDonald, 2005). Furthermore, Tierney suggested that students' cultural backgrounds be considered when designing instructional programs, and these programs should be designed for a sustained and articulated delivery over the term of the students' education. Qualitative techniques and mixed methods techniques (i.e., utilizing both quantitative and qualitative data collection and analysis techniques within the same framework; Johnson &

Onwuegbuzie, 2004) also could play an important role in increasing our understanding of how and why so many students graduate from high schools not being adequately prepared for college.

The state of Texas created a new indicator in the reporting of school and district performance. Perhaps as high schools become more accountable for CRS, administrators and teachers will begin identifying the most effective means of preparing all students for college-level work. However, these challenges are not the sole responsibility of the high schools. Middle schools also must align their curricula with more rigorous standards that will help students prepare for the increased rigors of high school as mounting research indicates that a student's decision to go to college and ability to obtain a college degree are the result of a complex process that begins at seventh grade or earlier (Cabrera et al., 2006).

We must determine what we can do to help all students be successful in more rigorous coursework in all areas. With so many of fastest-growing jobs requiring some form of postsecondary education, it is imperative that the state, the universities, and the school districts proactively rethink and redesign our high schools so that we truly prepare all students for a future that includes the opportunity to participate in postsecondary education.

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