A Comparison of the Impact of Preparedness of Students Entering College and Students' Academic Attainment between Selected HBCU and Non-HBCU

Isaac Bonaparte
Howard University, Department of Accounting

Lucy Lim
Howard University, Department of Accounting

Ephraim Okoro
Howard University, Department of Marketing

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Abstract

Longitudinal data collected from the National Center for Education Statistics (NCES) for the period 2003-2009 reveal that among a sample of 2,275 African-American students, there were no significant difference in the preparedness of students entering HBCU and non-HBCUs. However, we find that relative to non-HBCUs, HBCU students are more likely to be placed in remedial courses. We also find that relative to non-HBCUs, HBCUs have a higher retention and attainment rate especially for the bachelor's degrees. We contend that HBCUs seem to prepare their students better to successfully attain bachelor's degrees by requiring underprepared students to take remedial courses as deemed necessary after evaluating their credentials. Such intervention enhances the capacities and abilities of underprepared students and equips them with the necessary capacities and abilities to succeed academically and to complete their undergraduate programs timeously.

Introduction:

The Organization for Economic Cooperation and Development (OECD) Program for International Student Assessment (PISA) reported that in 2009 United States' students ranked a disappointing 25th out of 35 countries in mathematics assessment. In another study that compared 15-year old students in the United States to their peers in other OECD countries, the National Center for Education Statistics (NAES, 2009) reported that the United States' students ranked abysmally in mathematics. These students were in the bottom quarter of countries that were sampled.

The statistics above portray a gloomy picture of what the future holds for the United States, a country very much respected and touted as a great nation around the globe that

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places much emphasis on education and academic standards. Sentiments expressed by Education Secretary Arne Duncan in 2009 captured the damming consequences of these revelations. She noted that "we are lagging the rest of the world, and we are lagging in pretty substantial ways. I think we have become complacent. We've sort of lost our way" (Holland, 2009). Further, Paul Peterson, a Harvard government professor in charge of the school's program on Education Policy and Governance, who edits the *Journal Education Next* warned of the dire consequences of such low performance by stating that "if we are going to grow at the rate that we hope to grow at to address the many issues that exist in our society, we need to have a powerful educational system that is producing a highly proficient workforce."

Poor student performance in mathematics has very serious ramifications on the future and competitive posture of a nation. It sends a very alarming signal about a country's readiness to effectively compete in the international arena in science and related disciplines. The United States, therefore, has a lot at stake and stands the risk of falling behind in many spheres of its development should the poor trend in student performance in mathematics persists. Therefore, the need to reverse the tide has become much more critical than ever before, especially in the face of competitive global economy and development agenda. State leaders, education administrators, and policymakers have a responsibility to formulate measures to arrest the downward trend of low achievement in mathematics. Indeed, reversing the trend will have a positive impact on the future of both developed and developing countries if they expect to remain competitive in the near future. A recent OECD study (Armario, 2010) predicts that an increase of 25 points on the PISA over the next two decades would result in an economic gain of $41 trillion for the United States' economy. It was equally emphasized that this economic gain can never be realized without a significant effort to increase the mathematics and science abilities of United States Students.

Statement of the Problem:

Within the United States many reasons have been identified for the poor or inadequate performance of students in mathematics and related subjects. For example, Burns (1998) attributes students' unsatisfactory performance in mathematics to what she terms "math bias." She contends that parents create anxiety in their children by demonstrating fear for mathematics, or placing over-emphasis on mathematics. She further argues that this parental concern or fear tends to create unnecessary anxiety in the children, and once this phobia is deeply ingrained in the minds of the children, it becomes extremely difficult to extricate it from their consciousness. Additionally, mathematics is one of the three core subjects (others are writing and arithmetic) that receive less attention in the school curricula. The National Center for Educational Statistics reported in 2011 that 47 percent of fourth-grade educators acknowledged that they spent more hours each week on English Language Arts as compared to mathematics (National Assessment of Educational Progress, 2011). This imbalance in the time devoted to teaching critical subjects strongly accounts for students' deficiency in comprehending mathematical concepts and formula.

Over time, some other important studies have attributed the poor performance in mathematics to socio-economic inequality such as academic tracking, lower levels of parental

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capital, and the poorer quality of primary and secondary schools in predominantly Black and Hispanic neighborhoods. The studies noted that these factors consistently account for the huge disparity in math skills among Blacks, Hispanics, and people of other race (Brayboy, Castagno, & Maughan, 2007; Condron & Roscigno, 2003; Darling-Hammond, 1995; Kao & Thompson, 2003; Lucas & Good, 2001; Orr, 2003; Roscigno, 1998). Additionally, Stiff and Harvey (1988) point out that mathematics classroom is the most polarized of all places in the United States. They stressed that despite efforts to breach the gap, only few Blacks and Hispanics take upper-level math classes in their schools. Extant literature shows that over 80% of African American students leave high school underprepared for college work. Authors Greene and Foster (2003) pointed out that African Americans are twice as likely as whites to be found in postsecondary remedial programs.

A study by the Virginia Department of Education of the academic indicators that are associated with high school students' successful preparation for college and careers revealed large disparities in performance in higher education mathematics courses across student demographic groups. The study found an 18-percentage-point gap between Asian and Hispanic students taking a credit bearing mathematics course and earning a C or better in that course (College & Career Readiness Initiative, 2012). The study determine that students' success in Algebra II determines whether or not they will enroll in credit-bearing mathematics courses in the university and whether or not they are likely to pass that course. The study further noted that students who performed well in Algebra II and writing tests had a high chance of passing English and Mathematics in their first year in college. It was, however, noted that minority students were less likely when compared to other students to be successful in college as a result of inadequate math preparation. The Common Core Standards Movement, a body that identifies the need for schools to adhere to certain core standards in schools to ensure that all students are college and career ready, stressed that students must, among other subjects, complete courses in Algebra I, Geometry, and Algebra II in order to be successful in school assessments. It was also noted that skills in Algebra II is a prerequisite for success in both college and the students' future career.

Statement of Objectives

The disparity in schools coupled with the poor performance of students entering college have attracted the attention of state policymakers and college administrators who are trying to identify lasting solutions to the problem (Attewell et al., 2006; Perin, 2006). Davis and Palmer, 2010) explained that while quality and equity of education are important considerations, state and institutional leaders need to understand how postsecondary education impacts success in four-year institutions. In addition, state policymakers and college/university administrators need to fully understand the impact and ramifications of poor student performance in mathematics on the nation at large. Copious studies in this direction have suggested the use of remedial classes to improve and sustain students' performance. Many arguments have been advanced in favor and in support of remediation as a reliable measure. Remediation refers to classes taken on campus that are below college level but are designed to better prepare and equip under-performing students to cope with the rigor of college-level work (Bautsch, 2013).

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While scholars against academic remediation consider it a waste of scarce financial and human resources (Breneman and Haarlow, 1998), other researchers have consistently argued in favor of remediation stating among other benefits that it helps less-prepared students acquire the relevant skills necessary to compete and succeed in college and to advance their future academic endeavors. Remediation also facilitates the integration of underprepared and under-performing students into the school population and to increase their chances of success in the competitive national and global school systems (Soliday, 2002). These benefits notwithstanding, studies in the last decade have revealed grave disparities between blacks and whites in remediation programs. For instance, while African Americans are twice as likely as whites to be found in postsecondary remedial programs (Greene and Foster, 2003; Adelman, 2004a P. 93; Bahr, 2010), the rate of successful remediation among Blacks and Hispanics is very low (Bahr 2010). Furthermore, while 62% of blacks and 63% of Hispanics enroll in remedial classes, only 36% of whites and 38% of Asians do so (Adelman, 2004a P. 93).

Review of the Literature:

Extant literature reveals a distinct disadvantage in math achievement among Blacks and Hispanics from as early as Kindergarten and traversing through twelfth grade (Bali and Alvarez, 2003; Braswell, Lutkus, Grigg, Santapau, Tay-Lim, & Johnson, 2001; Farkas, 2003; Fryer and Levitt, 2004; Kao and Thompson, 2003; Riegle-Crumb, 2006). Furthermore, Rose and Betts (2001) determined that the effect of this huge racial disparity is that by the end of the twelfth grade only a handful of Blacks and Hispanics are prepared for college work. Their studies pointed out that while 25% of Blacks and 20% of Hispanics are prepared for college-level math, 39% of their white counterparts are. Evidently, there is the need to bridge this racial disparity in order to increase the level of college enrolment for the disadvantaged groups in the American society. It is equally significant to emphasize that attempts aimed at providing equal opportunities for all students irrespective of race and color have already been initiated. Landmark Supreme Court cases (Brown v. Board of Education of Topeka, 1954) and critical pieces of legislation (Civil Rights Act of 1964; Higher Education Act of 1965) have provided some level of opportunity for African Americans to make some moderate achievement in education. A study conducted by the American Council on Education (ACE) revealed that between 1996 and 2006, college enrolment for African American students increased by about 46%. Additionally, Kozol (2005) attributed the disparity in education between African American and their White counterparts to factors such as weak college preparatory curriculums, ineffective and inefficient guidance counselor services, unqualified/incompetent teachers, minimal and archaic school materials, and inadequate school facilities. Similarly, Condron & Roscigno (2003) determined that the educational disparity is largely due to unfunded and poorly structuring of the schools that serve the African American students. In a recent study, Bahr (2010) concluded that racial discrimination is very distressing and that it is not only a major contributing factor, but it persists even to the lowest echelons.

So far studies regarding the influence on institutional racial context has produced mixed results. Bahr (2010) finds that Black students who attend predominantly Black colleges are equally as likely as their Black counterparts in colleges that admit fewer black students to

achieve college-level math skill. However, non-black students who enroll in predominantly black institutions are less likely to remediate successfully. This result is inconsistent with some prior work concerning the effect of institutional racial composition (Pascarella & Terenzini, 2005).

Hypothesis Development:

Bettinger and Long (2009) examined the effect of remediation using a unique data set of over 28,000 students. They noted that many students take remedial or developmental post-secondary coursework in order to better prepare for college work. They found that students who enroll in remediation programs are more likely to succeed in college compared to students with similar backgrounds who are not made to enroll in the remedial programs. Further, Parsad, Lewis and Greene (2003) concluded that the rates of remediation in mathematics, a subject that most students find very difficult, differ largely by race. They determined that Blacks and Hispanics, the groups most disadvantaged in society, tend to experience very low remediation rates compared to their white and Asian counterparts. Bahr (2010) examined racial differences among students who successfully remediated in mathematics by passing in a college-level mathematics course. The study revealed that race accounts for the successful remediation in math. Numerous other studies established that Blacks and Hispanics begin the remediation math program with very high average differences than their Whites and Asian counterparts (Bali and Alvarez, 2003; Braswell et al., 2001; Farkas, 2003; Fryer & Levitt, 2004; Kao and Thompson, 2003; Riegle-Crumb, 2006). Bahr (2010), however, found that the effect of race diminishes after successful remediation. This is because long-term benefits accrue at comparable rates to Whites, Blacks, Asians, and Hispanics after successful remediation.

Based on the above findings, this study posits that all things being equal, the Black student preparedness when entering college will not be substantially different between HBCUs and non-HBCUs. Stated in the null form:

H1: *There is no significant difference in the impact of Black student preparedness between HBCU and non-HBCU students entering college*.

Then we examine their academic life. We are especially interested in the remedial courses that the HBCUs and non-HBCUs students may take. Our hypothesis stated in the null form is:

H2: *There is no difference in the proportion of students taking remedial courses in HBCU and non-HBCU.*

If there is no difference in the preparedness between HBCU and non-HBCU students and no difference in their academic experience, then we expect to see that the cumulative retention and attainment of Black students in HBCU and non-HBCU will be similar. The hypothesis stated in the null form is:

H2: *There is no significant difference in the cumulative retention and attainment of Black student in HBCU and non-HBCU*.

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Research Design/Methodology

Data for this study is taken from the National Center for Education Statistics (NCES) database. For purposes of this study, we focus on 2,275 African American students entering college in 2003-2004 and examine their admission test scores, high school GPA, and the highest level of mathematics. We also examine their graduation rates through 2009 (BPS2009). We analyze the data using Powerstat.

To test hypothesis 1, we examine the mean ACT/SAT scores of students entering HBCUs and non-HBCUs. We also examine their high school GPAs and their highest level of high school math in order to ascertain variations (if any) in the extent of preparedness of students entering HBCUs and non-HBCUs. We depict our results in Panels A, B, and C of Tables 1. We then examine the academic life of students during college to ascertain any differences in their experiences during the period of study. We contend that such differences in academic life could potentially impact student performance. By analyzing the experiences, therefore, we would be able to contribute towards improving the educational experience of students and consequently their performance. We operationalize academic life using student GPA in college and measures including but not limited to work study etc. We depict our results in Table 2.

We also compare remedial courses taken by the students in HBCUs and non-HBCUs (hypothesis 2). Remedial courses have the potential to improve student overall academic performance in college. We further subdivide the remedial sample based on specific subjects to ascertain differences in remediation subjects taken and to ascertain if such remediation subjects impact overall student performance in college. We also examine the likelihood of students with certain high school GPAs to take remedial courses. We depict our results in Table 2 Panel F.

To test hypothesis 3, we compare the cumulative retention and attainment through 2009 and the students' overall GPA to examine students' achievement at the end of their study. We document our results in Table 3.

Results

In Table 1, we use three variables: admissions test scores, high school GPA, and the highest level of high school mathematics to ascertain the academic preparedness of black students entering HBCU and non-HBCU. The results as depicted in Panels A, B, and C of Table 1 show that there is no statistically significant variation in the preparedness of students entering HBCUs and non-HBCUs. We find that the mean ACT or SAT, the proportion of students with certain high school GPAs, and the proportion of students having a certain high school level math do not differ materially between HBCU and non-HBCU. Thus, we cannot reject hypothesis 1 that there is no difference in the preparedness of students entering HBCU and non-HBCU.

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Table 1 Academic Preparation

Panel A

	Mean of ACT or SAT
Non-HBCU	813.506
HBCU	820.361
t-test	0.31

Panel B

Proportion of students in certain High School GPA range (%)				
GPA	0.5-1.4	1.4-2.4	2.5-3.4	3.5-4
Non-HBCU	2.90%	27.00%	54.30%	15.70%
HBCU	0.90%	31.90%	48.50%	18.70%
t-test	-1.52	0.66	-0.94	0.54

Panel C

Proportion of students in each high school math level (%)					
	None of these	Algebra 2	Trigonometry /Algebra II	Pre-calculus	Calculus
No	16.629	38.833	18.543	18.29	7.706
Yes	9.683	34.653	20.184	24.924	10.556
t-test	-1.57	-0.68	0.4	0.97	0.91

In examining the academic life during college, we find that there is no statistically significant variations in the average GPA of students in HBCU and HBCUs (Table 2 Panel A). We document that although there are more black students in non-HBCU that always worked part time while in school (Table 2 Panel B), the number of hours worked while enrolled through 2009 between HBCU and non-HBCU students (Table 2 Panel C) are similar.

In Table 2 Panel D we find that more HBCU students took some type of remedial course in 2004 (t-test is positive and significant). When we examine the remedial courses by subject, we find that more students in HBCU took remedial course in math. We also find that there are no differences in the proportion of black students taking other remedial courses in both HBCU and non-HBCU (in line with hypothesis 2). The results in Table 2 Panel F show that there are no differences in the proportion of students that took remedial courses in each GPA category in both HBCU non-HBC. We find that the proportions are similar across GPA categories with approximately 24-35% of students in each GPA category taking some type of remedial courses.

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Table 2 Academic Life

Panel A

	Average GPA 2003-2004
Non-HBCU	2.73
HBCU	2.50
t-test	1.47

Panel B

Percentage of student in each attendance intensity through 2006 (%)			
	Always full-time	Always part-time	Mixed
Non-HBCU	59.518	12.607	27.875
HBCU	67.578	4.196	28.226
t-test	1.26	-3.09*	0.07

Panel C

	Job while enrolled 2009: Mean of Hours worked per week
Non-HBCU	15.919
HBCU	17.905
t-test	0.59

Panel D

Proportion of students taking any remedial course taken in 2004		
	No	Yes
Non-HBCU	76.318	23.682
HBCU	66.962	33.038
t-test		1.9*

Panel E

Proportion of students taking remedial course in 2004 in each subject

	English		Math		Reading		Study Skills		Writing	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Non-HBCU	91.8	8.2	81.9	18.1	91.0	9.0	97.1	2.9	92.2	7.8
HBCU	89.4	10.6	73.7	26.3	86.9	13.1	98.0	2.0	93.5	6.5
t-test		0.82		1.78*		1.03		-0.71		-0.35

Panel F

Proportion of students taking any remedial course taken in 2004 given that they have certain high school GPA						
	High school GPA :0.5-2.4		GPA=2.5-3.4		GPA=3.5-4	
	No	Yes	No	Yes	No	Yes
Non-HBCU	73.3	26.7	72.1	27.9	76.4	23.6
HBCU	69.61	30.4	65.9	34.1	74.9	25.1
t-test		0.43		0.72		0.13

Table 3 compares the cumulative retention and attainment of students through 2009 and the students' overall GPA to examine students' achievement at the end of their study. We find that HBCU surpassed non-HBCU in both retention and attainment of bachelor's degrees. While 23.9% of black students that entered HBCUs earned bachelor's degrees, only 10.3% of students did so in non-HBCUs. However, we find that HBCUs have lower cumulative retention and attainment for associate's degree (2.1% vs. 7.4%) and certificate's degree (1.9% vs. 11.5%). We also find that there are no significant differences (t-values are not significant) in the cumulative retention and attainment for students who did not pursue any degrees in HBCU and non-HBCU. We document that relative to non-HBCUs, HBCU students are more likely to graduate with a higher degree (bachelor versus associate/certificate). We also document that relative to HBCUs, non-HBCU's black students are more likely to have GPAs greater than or equal to 3.5 (Table 3 Panel B). We also find that although there are more students in the non-HBCU that earn higher GPA, most of them earn associate or certificate degrees. Overall, we find that black students in HBCU colleges earn the higher degree (bachelor). Based on the above analysis, hypothesis 3 is not supported.

Table 3 Attainment

Panel A

Proportion of students in each cumulative retention and attainment at first instance: 6-yr total 2009 (in %)						
	Bachelor's degree	Associate's degree	Certificate	No degree, still enrolled	No degree, transferred	No degree, left without return
Non-HBCU	10.3	7.4	11.5	7.5	28.3	35.1
HBCU	23.9	2.1	1.9	6.8	34.3	31.0
t-test	1.82*	-2.62*	-5.47*	-0.31	1.32	-0.56

Panel B

Proportion of students in each range of GPA at all institution attended (in %)

	< 2.50	2.50-2.99	3.00-3.49	>=3.50
Non-HBCU	48.5	22.2	20.0	9.4
HBCU	56.8	21.1	17.3	4.9
t-test	1.13	-0.21	-0.07	-1.85*

Note on the variables:

Admissions test scores (ACT or SAT):
Concordance table is taken from the following source: N. Dorans, Correspondences between ACT and SAT I Scores (College Board Report No. 99-1) (New York: College Entrance Examination Board, 1999): http://www.collegeboard.com/research/pdf/rr9901_3913.pdf. This table is constructed from agency-reported or institution-reported test scores in the following order of precedence: first, agency-reported (College Board) SAT I verbal and math scores; second, agency-reported (ACT) ACT composite score; third, institution-reported (CADE) SAT I verbal and math scores; and fourth, institution-reported (CADE) ACT composite score.
High school grade point average (GPA):
For a number of respondents, both College Board and ACT score reports are available. In these cases, high school grade and curriculum information from the more recent test date is used.

Highest level of high school mathematics:
For a number of respondents, both College Board and ACT score reports are available. In these cases, high school grade and curriculum information from the more recent test date is used. For respondents who had neither of these reports available, responses to items from the student interview pertaining to math course-taking is used.

Grade point average 2003-04:
First based on GPA reported by the sampled NPSAS institution in CADE. If this was not available, student-reported GPA is used. The GPA was standardized to a 4.00 point scale.

Remedial course 2004: Any taken: From NPSAS: 04 student interview.

Job while enrolled 2009: Hours worked per week:
Summer hours were excluded if respondent was not enrolled during the summer. Assigned zero if respondents did not work while enrolled.

Cumulative retention and attainment at first instance: 6-yr total 2009:
Respondents enrolled in any months after January 2009 were considered to be still enrolled.

Conclusion and Recommendations:

The data show that there are no differences in the preparedness of students entering college between HBCU and non-HBCU. However, there are more students in the HBCU taking some form of remedial courses compared to non-HBCU students. The final results show higher retention and attainment for HBCU students in the bachelor's degree programs, the highest degree that the first time students entering college can attain. Therefore, non-HBCUs need to assess their students' credentials more carefully, especially those in the bachelor program, in order to effectively ascertain the need for remedial courses. It appears that HBCUs prepare their students better to successfully attain bachelor's degrees by carefully assessing entering students' credentials, and requiring students with deficiencies in certain areas to take remedial courses as necessary. Such proactive measures better equip and prepare students to finish their undergraduate programs timeously.

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