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African American Students' Participation in Online Distance Education in STEM Disciplines: Implications for HBCUs

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Abstract

Despite the increase in online distant learning initiatives at many of the nation's colleges and universities, collectively, Historically Black Colleges and Universities (HBCUs) continue to lag behind non-HBCUs in the development and implementation of online courses and programs. Data produced by the National Center for Education Statistics show that African American students are enrolled in significantly less distance education courses when compared with White students. In addition, there is a substantial disparity in the number of online science, technology, engineering, and mathematics (STEM) courses and programs when compared with online courses and programs in education, business, or the social sciences at HBCUs. The primary aim of this article is to examine data that explore African American students' participation in distance education in STEM disciplines. Recommendations for future research are also discussed in this article.

Keywords

online distance education, African American students, HBCU, STEM, educational research

Introduction

Historically Black Colleges and Universities (HBCUs) have had a long history of providing quality educational experiences to underrepresented minority students (URMs). Accounting for only 2% of the nation's colleges and universities, HBCUs award a significant number of degrees to African American students at the bachelor's, master's, and doctoral level across all academic disciplines. HBCUs have also been instrumental in producing a significant number of African American graduates in science and engineering (National Science Foundation, Division of Science Resources Statistics, 2011). For all of the success HBCUs have had in educating African American scientists and engineers, efforts to broaden participation in science, technology, engineering, and mathematics (STEM) education and STEM careers for African Americans and other underserved ethnic groups remain a prevailing issue in the educational system (Museus, Palmer, Davis, & Maramba, 2011). The production and implementation of online distance education courses and online programs in science and engineering could offer additional avenues for minority-serving institutions to provide students with increased opportunities to enroll in STEM courses. Distance learning as defined by Greenberg (1998) is a "planned teaching/learning experience that uses a wide spectrum of technologies to reach learners at a distance and is designed to encourage learner interaction and certification of learning" (p. 36).

Recent data demonstrate that HBCUs and primarily White institutions (PWIs) have a similar technological infrastructure in place for distance learning degree programs (Moore, 2008). This empirical finding would suggest that as HBCUs are fully capable of implementing online programs, most of these institutions would have taken full advantage of opportunities in distance learning for overall university advancement. Unfortunately, most HBCUs in America do not offer online programs in STEM fields; however, a few offer online programs in non-STEM fields. Thus, the purpose of this report is to examine African American students' participation in online distance education and to bring to light the need for HBCUs to develop and enhance distance education programs in STEM fields and other disciplines to increase their academic competitiveness and sustainability. In addition, this article purports to offer specific research recommendations for educational researchers exploring the issue of increasing African American students and HBCU participation in online distance learning. Smith (2011) noted that "HBCUs, which have traditionally provided an education for

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people who might not have otherwise had the opportunity, have an imperative to take their programs online" (p. 25).

The lack of HBCU competitiveness in providing quality online distance education programs for African American students have forced significant numbers of African American and other minority college students to consider for-profit online universities such as Kaplan University and the University of Phoenix. URMs are willing to pay exorbitant tuitions even in the absence or in conjunction with federal assistance to seek the convenience and advantages online delivery methods provide (Poley, 2008). HBCU administrators must take a more active role in implementing online programs and courses on their campuses. HBCUs must continually study research literature and successful online education models to transition from higher education institutions with weak or nonexistent online programs to institutions that provide high-quality online learning environments. Furthermore, HBCU administrators must provide ongoing academic and financial support to faculty committed to teaching online. In addition, HBCUs must provide mechanisms for sustainability of online programs such as faculty training, technology enhancements, and procedures for effective formative and summative assessments for online courses and programs.

Many HBCUs have qualified faculty members who are willing to engage in online teaching; however, they are faced with conflicting attitudes and divergent dispositions from obdurate administrators and department chairs who do not appreciate the institutional advantages of offering online courses. Moreover, based on the literature, there seems to be consistent themes regarding HBCUs' lack of enthusiasm for adopting online distance education programs including, but not limited to, faculty and administration reluctance, expensive start-up and instructional development costs, lack of course facilitation expertise, perceived deficits in learning outcomes, poor student perceptions and characteristics, and accreditation issues (Allen & Seaman, 2007; Beasley, 2010; Miller & Husmann, 1999; Poley, 2008). A major concern among educators regarding online courses with laboratory components is the perception that less skills are gained with virtual labs due to the lack of hands-on activities when compared with wet labs offered with face-to-face courses (Jeschofnig & Spencer, 2008). However, previous studies demonstrate the effectiveness and quality of online labs (Wolf, 2010). Well-developed virtual labs provide interactive experiences during which students observe and manipulate computer-generated objects, data, or phenomena to fulfill the learning objectives of a laboratory experience (Stuckey-Mickell & Stuckey-Danner, 2007). In fact, many U.S. health professional schools incorporate the use of virtual labs as major components of the medical education curriculum (Lovell & Vignare, 2009).

The Sloan Consortium, an international professional organization devoted to the improvement of online education, recently described substantive student enrollments in online courses in *Class Differences: Online Education in the United States*. Allen and Seaman (2010) reported a 21% growth rate for U.S. higher education student online enrollments suggesting that online learning is becoming a more viable teaching and learning strategy in the higher educational system. The Sloan Consortium also surveyed university administrators to determine their perceptions regarding the future of online education at their respective institutions. Overwhelmingly, participants in the study viewed online education initiatives favorably and believed that online education could provide economic, teaching, and learning transformative advantages. Moreover, several million U.S. college/university students have reported enrolling in at least one online course while pursing their academic degree (Allen & Seaman, 2010).

Online education learning initiatives have continued to soar over the last decade (Figure 2) and are widely recognized to offer several significant benefits to academic institutions. For example, successful online programs have been shown to counteract reduced institutional budgets and gloomy economic forecasts. The infusion of distance education programs may present viable cost-effective strategies for HBCUs to improve their overall revenue problems and associated negative outcomes (e.g., abated course and academic program offerings, reduced student support services, reduced faculty and staff, and reduced student enrollments). Although there have been slight increases in historically Black institutions with online degree programs, in 2010, only 18% of the nation's 105 HBCUs possessed online degree programs (Beasley, 2010). Furthermore, analysis revealed that only 9% of the online programs at HBCUs are in the STEM disciplines. In contrast, a higher percentage of non-HBCUs have been reported to offer distance education courses and programs.

There are many student advantages to taking an online course such as the ability to learn at your own pace and the opportunity for greater flexibility and convenience to complete degree requirements while managing complex family, social, and work schedules. Not surprising, a common theme among students regarding the benefits of online courses is the convenience of completing coursework and flexibility of instructional strategies rarely utilized in the traditional classroom. Numerous reports have also demonstrated that learning gains in online courses meet or exceed learning gains in traditional courses (Bernard et al., 2004; Dell, Low, & Wilker, 2010; Summers, Waigandt, & Whittaker, 2005; Weber & Lennon, 2007). Moreover, results from a research study conducted by Warren and Holloman (2005) revealed that there are no significant differences in student learning outcomes between online instruction and traditional instruction. In their study, two groups of students from the same course were selected as participants and received the same content via different modes. One group of students was randomly selected for online instruction and another group of students were randomly selected for traditional face-to-face

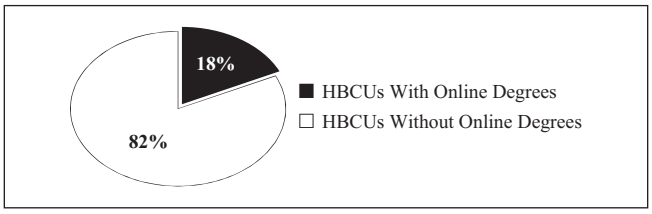


Figure 1. Percentage of HBCUs offering online degrees
Note: HBCU = Historically Black Colleges and Universities. Adapted from Beasley (2010).

instruction. Data from pre- and postquantitative survey instruments show minimal differences in understanding of course content. Similar studies also provide support for online distance learning instructional strategies as viable and meaningful educational approaches. Using the hierarchical linear model and multiple regression analysis, Chen, Lambert, and Guidry (2010) reported that there is a positive association between web-based learning technology participation and increased student engagement.

Method

Data Sources

Descriptive data were compiled using data from the National Center for Education Statistics (Parsad & Lewis, 2008; Waits & Lewis, 2003) and the HBCU Distance Learning 2010 report (Beasley, 2010). In addition, the current article utilizes data from the 2007-2008 National Postsecondary Student Aid Study data set designed to study college students and postsecondary institutions. The NPSAS was conducted by the NCES (Cominole, Riccobono, Siegel, & Caves, 2010) and contained a student sample of more than 19 million undergraduate student participants from 2-year and 4-year Title IV degree-granting postsecondary institutions participants in the study. The descriptive variables described in this report were accessed through the Data Analysis System supported by NCES.

Variables

The percentage of HBCUs offering online degrees and other academic institutions offering online courses were investigated in this report using descriptive data (Figures 1 and 2). To analyze the percentage distribution of African American student participation in distance education by college major, variables that measured the percentage of students enrolled in a distance education course in 2007-2008 (DISTEDUC) and identified STEM majors, non-STEM majors, and undeclared majors (STEMMAJ) were selected. Data sample filters were used to create tables only including African American students (Table 1). To analyze the distribution of student participation in distance education by race, the DISTEDUC and RACE variables were used to target African American and White students (Figure 3).

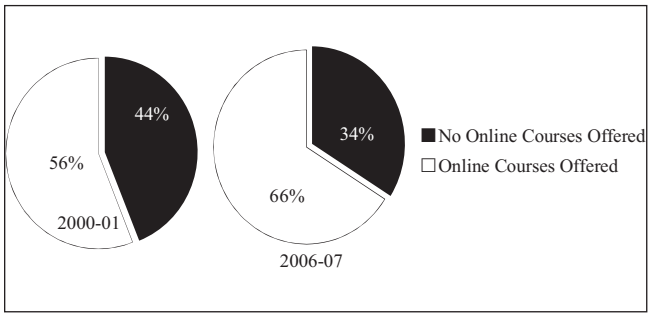


Figure 2. Percentage of 2-year and 4-year Title IV institutions offering distance education courses: Trend analysis
Source: U.S. Department of Education.

Table 1. Percentage Distribution of African American Students' Participation in Distance Education

Major field	STEM majors	Non-STEM majors	Undeclared majors
Distance education course (%)	10.8	78.1	11.1

Source: U.S. Department of Education.
Note: Data were significant at the $p < .05$ level.

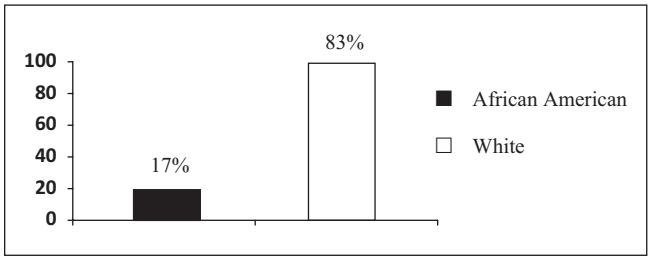


Figure 3. Percentage distribution of student participation in distance education by race
Source: U.S. Department of Education.
Note: Data were significant at the $p < .05$ level.

Results

Figure 1 shows that 18% of the 105 HBCUs possess online degree programs. Figure 2 shows that between 2000 and 2007, there was an increase in the number of 2-year and 4-year Title IV academic institutions that proffered online courses. As shown in Table 1, very low percentages of African American students with STEM majors enrolled in an online course during 2007-2008. Figure 3 indicates that White college students (83%) participated in far more distance education courses than African American college students (17%) during the survey period. Independent-samples *t* tests were employed to determine whether statistically

significant differences were present (Table 1 and Figure 3). All of the results were reported significant at the $p < .05$ level.

Discussion and Implications

Advancing educational opportunities for HBCU students must remain at the forefront of HBCU stakeholders. In this article, we proposed that many HBCUs must examine and enhance their online distance education initiatives to keep pace with the ever-changing educational landscape. It is imperative that HBCUs fully engage and invest in online education, particularly in STEM online courses and programs. An increased emphasis in the development of online STEM courses and STEM degree programs at HBCUs is needed to provide African American students more options to pursue degrees in science and engineering. This article presents data from the NCES and other sources that supports the assertion that an extremely low percentage of HBCUs offer online degrees (Figure 1), that African American STEM majors enroll in far less online courses when compared with non-STEM majors (Table 1), and that African American students have fallen behind White students in the area of online course matriculation (Figure 3).

Due to the dearth of research literature in this area, this article advocates the infusion of quality research studies designed to encourage the development and implementation of online courses and degree programs at HBCUs. In addition, there are a limited number of research articles that explore HBCU students' learning styles, educational outcomes, and experiences in STEM online courses. It is envisioned that future quantitative and qualitative research findings will facilitate original research, theories, policies, and practices designed to improve minority participation in the online experience and may subsequently induce gains in minority and women access in STEM fields to address science and engineering workforce diversity problems.

Future Directions

Employing mixed-methods research designs, educational researchers must collect data to highlight potential advantages of online learning in STEM. Inevitably, the infusion of rigorous empirical research studies comparing cognitive and affective outcomes in traditional versus fully online STEM courses must be performed to address the shortage of educational literature on this topic (Phipps & Merisotis, 1999). To address the scarcity of research devoted to distance education and HBCUs, the corresponding author is near completion of a study titled "*Examining the Impact of Online Distance Education on Student Learning and Student Engagement in STEM Disciplines at Historically Black Colleges and Universities.*" The study was designed to collect quantitative and qualitative data from HBCU students enrolled in online STEM courses. A quantitative survey was distributed to a sample of HBCU undergraduate students enrolled in online distance education courses in the STEM disciplines and to undergraduate students enrolled in traditional STEM courses. The qualitative component of the study was designed to examine similarities and differences in educational outcomes between HBCU undergraduate students enrolled in online and traditional STEM courses. The research findings of the aforementioned research project will provide beneficial information regarding the extent to which online courses in the STEM disciplines enhance student learning and student engagement. Moreover, the data from the educational research project will be used to facilitate the development of student-centered pedagogical strategies that enhance online learning experiences that complement students' learning styles and provide a fundamental knowledge of the subject matter. The reliable research design employed in the study will serve as a research model that can be replicated to investigate factors that explore educational strategies to improve online and traditional courses in STEM disciplines at HBCUs and other academic institutions. Active dissemination of empirical research studies examining online teaching and learning strategies will better educate HBCU faculty and administrators regarding the financial, pedagogical, and cognitive advantages of online courses and degree programs in STEM.

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