IMPROVING EDUCATION EQUALITY, WHILE DIVERSIFYING STEM

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IMPROVING EDUCATION EQUALITY, WHILE DIVERSIFYING STEM

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Aunton Terry

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I would like to acknowledge my Lord and Savior Jesus Christ for blessing me through my lifetime. I also would like to thank Chancellor Dennis Shields, Joyce Burkholder, Angela Miller, Kari Hill, Laurie Hamer, Rose Smyrski, Louis Nzegwu, Joe Lomax, Pat Bromley, Evelyn Martens, and everyone who contributed to me being here today. I want to most importantly thank my mother (Antoinette Dixon) for being the strongest women in the world and being a single mother raising five children.

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Aunton Terry

Under the Supervision of Dr. Patricia Bromley

Abstract

America has a reputation for being competitive in science, technology, engineering, and mathematics (STEM). In order for America to maintain its global competitiveness it is very important that we improve education equality and diversify the STEM industry. This study discusses school funding disparities, the programs designed to increase diversity in STEM and systematic factors that negatively impact underrepresented minorities (URM). The URM groups consist of African-Americans, Hispanics, and Native American- Indian or Alaskan. This paper explores the many different ways of explaining the disproportionately low numbers of URM students majoring in STEM fields. Understanding the disconnection is crucial for recognizing the barriers preventing URM students from choosing a STEM majors. In addition, the paper also shares the factors that contribute to URM students overcoming these barriers and becoming successful. This paper explores the school funding disparities, the barriers preventing URM students from getting involved in the STEM fields, and some positive ways URM students can get involved in STEM to create more diversity in those fields.

Chapter One: Introduction

Statistics from the National Action Council for Minorities in Engineering (NACME) show that URM persons represent 27% of the U.S. population; however, URM only represent 15% of people working in STEM fields. The average graduation rate for college students in the United States is 63%, whereas it is only 39% for URM students. This dynamic is a result of URM students lacking the proper preparation in STEM subjects. In turn, the transition from high school to college is more difficult for Underrepresented Minority (URM) students than their counterparts (Museus, S., Palmer, R., Davis, R., Maramba, D., 2011b).

Across the country white students are being educated and given opportunities that very few URM students are afforded. White children are being given resources in schools that URM children can only dream of. In addition, white students are also given more qualified teachers, more up-to-date textbooks and better technology for hands-on activities. This may explain why URM are outnumbered in jobs in job in STEM careers that require additional schooling.

In order for the United States be globally competitive in STEM Fields, we must provide equal resources to our public schools throughout the country. By providing equal opportunities for high quality public education for all students, the U.S. can increase the number of URM students involved in STEM disciplines. The population of URM students, which consist of African-American, Hispanic, Native American, or mixed ethnicity students, receives fewer opportunities than do students attending schools in affluent communities.

Many URM secondary schools lack funding and programs to improve diversity in STEM, which creates a problem because URM usually are not fully educated in these fields by the time they go onto college. In addition, many higher education institutions fail to realize the importance of implementing specifically targeted programs to help URM students do well in STEM. Murphy Gaughan, Hume, and Moore (2010) looked at both the individual-level factors that affect these disturbing statistics about URM students enrolling and succeeding in STEM and the institutional-level programs designed to improve diversity in STEM. An interesting concept that they examined was the implementation of programs aimed at improving diversity in STEM at both levels (Museus, S., Palmer, R., Davis, R., Maramba, D., 2011a).

Statement of the Problem

Lack of educational opportunities for URM schools has created barriers for URM students in the STEM industries. Resources in URM schools are far less advanced than the resources in affluent schools, which is causing URM students be ill-prepared for STEM education in college. Can URM students be successful in STEM? What factors create barriers to URM students succeeding in STEM in college? What practices account for the fact that HBCU's graduates at such a higher proportion of URM in STEM than their majority white counterparts? What programs and practices should higher education institutions engage in in order to assure URM student success in STEM fields?

Limitations

One limitation in this study is that the proposed STEM is Possible (SIP) bridge program is to be offered at UW-Platteville for only six-weeks, so there is a limited amount of time. Another limitation in this study is the fact that not everyone will come into the program with the same preparation and it will be very challenging to get everyone caught up to the same levels.

The third limitation is the learning curve of these students. Not everyone will automatically understand the material and it will be a challenge for the teachers to keep everyone interested in learning more.

Chapter Two: Review of Related Literature

Programs for URM Students in STEM

School funding in the U.S. is very unequal and many URM schools lack funding to offer programs to improve diversity in STEM. This creates a problem for URM students because they are not fully educated in these fields by the time they are done with high school and go to college. In addition, many higher education institutions fail to realize the importance of implementing specifically targeted programs to help URM students do well in STEM. Murphy et al. (2010) looked at both the individual-level factors that account for these disturbing numbers and the institutional-level programs designed to improve diversity in STEM. An interesting component that they examined was the implementation of programs aimed at improved diversity in STEM in high schools and colleges (Museus & Liverman, 2010).

At the institutional-level, schools should design programs that clearly address the issues of URM in STEM. Higher education institutions have to recognize whether specific programs or events actually help improve graduation rates of URM students in STEM. The two important barriers at the institutional level are the universities and the professoriates. In contrast, a proactive and sincere commitment from universities and their faculty and staff can be a crucial factor in increasing diversity in STEM (Museus & Liverman, 2010). Institutions should design a summer bridge program that can relate to the individual's environment.

Factors at the individual-level that affect URM students' participation in STEM can be crucial if URM students are to do well. Some important demographic characteristics universities should be aware of at the individual level are race, gender, residency, and socioeconomic status (SES). Student participation in summer bridge programs before entering their first year of college helps the student retain some of the information they learned throughout the school year

(Museus & Liverman, 2010). This could enhance performance in college classes.

Student preparation before college is very important; therefore, institutions must also consider the students' high school grade point average (GPA), Advanced Placement (AP) credits and SAT scores. Unfortunately, high school students have very little control over whether AP classes are available at their school. Therefore, institutions have to accommodate for URM students' needs as much as possible when designing programs.

Reichert and Absher (1997) conducted a study in 1997 on higher education institutions that had high retention and graduation rates for African-American engineers. They used data from the National Action Council of Minority Engineers (NACME) to identify and study top universities' performances. The results showed that the best way to increase diversity in STEM is for universities to show a sincere and ongoing commitment to counteract these barriers to minority students' success.

The programs they studied provided academic support, minority engineering societies, scholarships, bridge programs, clustering, and outreach programs to improve preparation, commitment, and engagement of URM. The study also revealed that institutions that offer a nurturing climate of cultural awareness, diversity, and inclusiveness are more successful than institutions that do not. This study demonstrates that institutions with high retention and graduation among URM students emphasize counseling, social support, and community memberships for URM. Specially, since minorities are more likely to use services that relates to their ethnicity (Reichert & Abshers, 1997).

According to the study, schools that offer services to assure comfortable student learning environments, which can address racial or equity issues, create a learning environment for students to participate and engage in without feeling like an outcast, or like they do not belong in the program. Students can learn in a diverse environment, as well as participate in hands-on activities.

Programs at Historically Black College and Universities (HBCU) to help URM students in STEM

Over the past decade the National Science Foundation has conducted studies on the number of African-Americans in science and engineering fields. Studies have shown that the proportion of bachelor's degrees awarded to African-Americans has increased from 7.7% in 1997, to 8.3 in 2006 (Kendricks, Nedunuri, & Arment, 2013). Moreover, that number has held stable between 8.3 and 8.4% since 2000-2006, suggesting that there is a huge need to continue to improve recruitment and retention programs for URM students.

Between 2002 and 2008, 60.2% of white students pursuing a STEM degree completed the degree within in six years from a four year university, whereas only 40.1% of African-Americans completed their degrees in STEM from a four year university. Of the 40.1% of the bachelor's degrees awarded to African-Americans in STEM from 2005-2008, approximately 21.4% were awarded from Historically Black Colleges and Universities (HBCU) (Kendricks, Nedunuri, & Arment, 2013).

Also in 2006, roughly one-third of black science and engineering doctorate recipients received their baccalaureate degrees from HBCUs. These statistics leave many non-HBCU universities across the country wondering how they can improve degree completion rates for African-Americans in STEM. Research suggests that universities across the country need to foster a unique cultural environment that supports the academic and personal growth of their student just as HBCU colleges do. A setting like this allows student that attend HBCUs to learn comfortably in a setting where they do not feel like an outcast or foreigner (Kendricks et al., 2013).

In 2009, Central State University (CSU) enrollment went below the nation average for student enrollment in STEM, so they started a mentor program called the Benjamin Baneker Scholars Program (BBSP). The program started with just five sophomores in the spring of 2009 and grew to twenty participants, from freshmen to juniors. By the fall of 2009, the program quadrupled the number of participants from five in the spring to twenty students in fall. Each student was required to follow the program's rules throughout the semester (Kendricks et al., 2013).

The program required each participating student to be in a STEM discipline and students had to have at least a cumulative 3.0 grade point average (GPA) or higher. The participants were assigned to a faculty member in their field of expertise as a mentor to meet with and attend programmed events. The BBSP required students to attend all the program's mandatory meetings, attain Honors Programs (if applicable), and meet once a month with their mentors (Kendricks et al., 2013).

Another requirement for the BBSP was that students had to join an Academic Learning Community, where students were required to take at least two classes, preferably STEM classes, with their fellow scholars. Students in the program were also required to stay together in the Honors Dormitory as a Living Learning Community. Professional Development Workshops and graduate school visits were another requirement for BBSP. This activity consisted of each student visiting a minimum of two college campuses per year (Kendricks et al., 2013).

Undergraduate research was another requirement for students in the BBSP. Students were required to apply for at least a STEM internship per year while participating in the program. The BBSP students were also encouraged to conduct at least one research project on or off campus to improve their research skills. Lastly, the students were all required to complete a pre and post regarding their satisfaction with the program. The findings from the surveys concluded that the BBSP helped tremendously and over 90% of the students credited the mentor program as having the largest impact on their academic success on the post BBSP survey (Kendricks, et al., 2013).

The Eight Factors That Contribute to the Lack of URM in STEM

This section will discuss eight factors that contribute to the lack of preparation URM students experience in grades kindergarten through the senior year in high school. The eight factors are: school funding disparities, schools not offering AP classes, lack of remedial tracking of URM students, lowered teacher expectation of the URM student, lack of qualified teachers, stereotype threats, oppositional culture, and early departure of high school. These factors not only hurt minorities but also stop the U.S. from being a competitive global force in STEM fields (Museus et al., 2011a).

School funding disparity.

The first factor that contributes to URM students not being ready for careers in STEM fields is the lack of preparation students experience in K-12 schools in STEM subjects. This factor works hand in hand with the school district funding disparities. School funding comes from three different sources of government: federal, state, and local.

At the federal level, the U.S. Department of Education provides approximately nine per cent of schools' funds. Most of those funds only cover two programs: No Child Let Behind and IDEAS Special Education. Other federal agencies which contribute to primary and secondary schools include the Department of Agriculture, which supports the funding for child nutrition;

the Department of Health and Human Services, which supports the Head Start program; and the Department of Labor, which supports state job training. Each of these departments has its own responsibility to support the students as much as possible but that nine per cent is hardly enough; therefore, school districts have to rely more on state funding (Carr-Chellman & Marsh, 2009).

State funding can differ from state to state but generally the state contributes roughly 47% of the school district's funding. These funds provided by the state to schools usually come from income and sales taxes. This creates a disparity because in some states funding can be as high as 86% and in some as low as 30%. States that rely heavily on property taxes have larger disparities because usually the funds are just not available in the schools' budget at the state level (Carr-Chellman & Marsh, 2009).

The state legislatures usually create a formula to determine how the funds are distributed among the school districts. The formula takes into account the number of pupils in a district, the number of students with disabilities, the number of students living in poverty, and the number of students that speak English as a second language. Some states have in their formula design that high poverty school districts with less access to local funding receive additional assistance (Carr-Chellman & Marsh, 2009).

Local funding for school districts is where the biggest disparity comes from. Local government collects property taxes from residential and commercial businesses as direct revenue to fund local school districts. Predominately URM schools receive less funding because many URM schools are located in inner-city areas where property taxes are much lower, so schools receive less funding (Carr-Chellman & Marsh, 2009).

In return, schools that receive the most funding are predominant in communities with very little diversity. These schools can afford to provide their students with better resources, smaller classes, and up-to-date textbooks, which all play a role in providing students with more preparation and a better education. Schools in wealthy communities can also provide their students with state-of-the-art laboratories, instructional material, and better technology to better prepare their students. Poor school funding leaves students in high-poverty schools at a severe disadvantage because schools cannot afford to properly prepare URM students like their counterparts, forcing URM's to learn from old curricula and outdated textbooks, and in oversized classrooms.

Lack of advanced placement classes.

The second factor that contributes to the funding disparity and the lack of URM students in STEM fields is the lack of Advanced Placement (AP) classes offered. Research shows that AP classes play a pivotal role in students' successfully transitioning from high school into college and, unfortunately, most URM schools cannot afford to offer as many AP classes as schools in affluent communities. So in addition to poor school funding, schools in impoverished communities cannot always offer AP classes to URM students, especially classes such as AP math and science (Museus, et al., 2011a).

Advanced Placement math and science classes prepare students and raise the students' interest in STEM subjects. Advanced Placement classes such as trigonometry or calculus are great tools to prepare students for college; however, if they are not offered then URM students cannot take advantage of the opportunities. These AP classes also keep the students' math and science skills fresh, which is extremely important when transitioning from high school to college. Studies found that even when these courses are offered, many URM students do not engage in taking these courses for four reasons.

First, URM students do not believe that taking these classes is beneficial to their future. Some URM students are not aware of the college preparation these courses offer. Second, URM students view these classes as difficult and not worth the investment. The URM students are not sure how these classes will improve their present situation. The third reason URM students do not take these AP classes such as calculus is because of math anxiety. Math anxiety has also been linked to URM students losing interest in math altogether. Lastly, URM students' elementary and middle school experiences cause URM students to avoid STEM subjects, especially if the URM student was placed in remedial classes at any level of education (Museus et al., 2011a)

Tracking into remedial classes.

The third factor that contributes to the lack of representation of URM students in STEM fields is the tracking into remedial classes. The URM students continually perform academically at a much lower level than white students. Despite the fact that public education is supposed to be the equalizing force between rich and poor, the academic achievement gap does not reflect that. The URM students enter school less prepared than white students and the achievement gap between the two groups continues to increase throughout the students' academic careers (Buszin, 2013).

The fact that the achievement gaps widen even while students are being educated should speak for itself; however, tracking students into remedial classes is an additional systematic issue, on top of the school funding disparity, because schools place students in classes based on their standardized test scores or the teachers' perception of the students' poor academic abilities. Needless to say, this causes a problem for students in URM schools because they are already less prepared academically than their white counterparts and they have fewer resources to assist them in improving their education.

The URM students are initially placed in these remedial classes for mathematics and science classes. Generally, in these remedial classes URM students are on very low-achieving academic tracks and often the students are not even challenged by the curriculum. This creates a cycle of leaving low-achieving students behind in classrooms where the achievement is shallow and the curriculum is oftentimes weak. It is difficult for URM students to succeed throughout the education system once in remedial courses because the curriculum is so shallow and pathetic (Museus et al., 2011a).

Buszin (2013), the author of "Beyond School Finance: Refocusing Education Reform Litigation to Realize the Deferred Dream of Education Equality and Adequacy," found that URM students at the age of 17 are performing at the same rate as 13-year-old white students. Basically, while students in schools in affluent communities receive higher-level curriculum and learn advanced STEM subjects, URM schools are struggling just to educate students on the basics because once URM students are placed into remedial courses, their likelihood of getting out and caught up to speed is very small. This causes URM students to lose interest in learning about STEM subjects and it also negatively impacts their future decisions about joining a STEM field later in life. Even when Hispanics and African-Americans have similar or better standardized test scores compared to white students, they are overrepresented in these remedial tracks (Museus et al., 2011a). This unjust placement can be largely due to the teacher's expectations of the students.

Teachers' expectations.

The fourth factor that causes this disparity in school funding and URM students in STEM is the teachers' expectation of the students. Teachers' low expectations of students can negatively impact URM students' interest in not only math and science but in education as a whole. Research shows that teachers are likely to form expectations that are consistent with the students' standardized test scores, instead of the students' actual abilities to learn. This dynamic negatively affects URM students because they are more likely to perform poorly on standardized tests than their white peers. Furthermore, teachers have been known to have higher expectations for their white students than their URM students, even if the URM students' standardized test scores are similar or better than their white counterparts' standardized test scores.

Teacher's expectations, whether positive or negative, can affect students' academic performance. Studies have shown that teachers with high expectations of URM students have greater academic success with the students inside the classroom and generally enjoy their teaching experience and make positive impacts in students' lives. These kinds of teachers give their students encouragement to become whatever they want to in life, instead of discouraging or belittling URM students' goals (Museus et al., 2011a).

Lack of qualified teachers.

The fifth factor that leads to imbalance of URM students in STEM fields is the lack of qualified teachers. The more experienced and higher paid teachers tend to work in schools where the need is small, whereas newer teachers with lower salaries tend to work in schools where the need for quality education is high (Carr-Chellman & Marsh, 2009). School districts hiring newer teachers, who sometimes are unqualified, into a higher need school can result in lack of preparation for URM students.

Research shows that students learn better when their teachers are more educated in the subject of study. The National Science Foundation (NSF), provided statistics showing that 34% of high-poverty schools have teachers teaching out-of-subject, compared to the 19% of low-poverty schools that have teachers teaching out-of-subject. The NSF also conducted a study in 2010, showing that white fifth graders were 51% more likely to be taught by a teacher with a master's degree or better compared to an extremely lower number of URM students (Museus et al., 2011a).

Other studies have shown that students attending predominantly URM schools were twice as likely to be taught by teachers with three years or less experience; however, teachers from predominantly white schools have an average of three years or more experience. Years of experience do not always determine if a teacher is qualified; however, the more time spent in the field the more experienced they should be. Many qualified teachers have the advantage of knowing what works when educating a student and what does not, or how to educate a student and how not to, as well. If funding was distributed evenly then URM schools could provide their students with more qualified teachers and possibly the students' interest in STEM would increase (Museus et al., 2011a).

Stereotype threats, oppositional culture, and early departure from high school.

The sixth factor that contributes to these disparities is stereotype threats. Stereotype threats negatively impact URM students' interest in STEM. These stereotype threats are usually the beliefs that certain jobs or majors are reserved to a specific race, gender, or culture. Qualified teachers, teachers' expectations of URM students, and tracking URM students into remedial classes are all forms of stereotype threats. Although stereotype threats can be a racial issue, it is very much so a gender issue as well for women in STEM (Museus et al., 2011b).

Many URM students and women have their own stereotype threats when it comes to STEM jobs. Most people believe these jobs are for white males simply because white males have ruled the STEM industries for so long and math and science fields have been stereotyped as being predominantly white males' fields. Therefore, URM do not apply themselves in these fields because they perceive STEM careers as jobs for white males. Removing stereotype threats allows more opportunities for URM students and creates one less barrier for URM students in STEM.

The seventh factor that contributes to the disproportionate number of URM students in STEM is oppositional culture. Many URM groups, especially African-Americans, have formed a culture in opposition to mainstream values due to the discrimination, racial oppression, and enslavement that they have experienced over many years. This factor creates a barrier for African-Americans and whites to move forward and look into the future.

African-Americans often try to convince their peers that education is for white people and it should not be valued as much, simply because of the harsh and unjust treatment that they have received throughout their history in the U.S. For example, some African-Americans perceive using proper English as "talking white" or being active in their education as "acting white." Hispanics also experience oppositional peer culture at a higher rate than whites. Oppositional culture can occur in women as well, especially when it pertains to math and science fields. This may further explain the disproportionate number of URM students in STEM (Museus et al., 2011b).

The last factor that contributes to the lack of diversity in STEM is when students depart early from high school. Early departure from high school plays an important role in URM students' lack of preparation to succeed in STEM fields. This situation typically applies to

Hispanic students who speak English as a second language or who may not be as proficient in English as others. Early departure from high school creates barriers for the students to graduate with the skills to pursue a STEM career. If URM students, especially Hispanics, do not possess proficient English skills then the educational system has failed and also created a bigger problem for the students' future (Museus et al., 2011a).

Speaking, reading, and writing in English are critical parts of being successful navigating through the educational system and if students are not prepared before entering into high school, then they will lose interest in education before getting to college. Hispanic students ages 16-24 have a 23% dropout rate, while African-Americans drop out at a rate of 11% and white students drop out 6% of the time. Without a high school education the likelihood for URM students pursuing a STEM degree is low (Museus et al., 2011a).

Six Factors That Help URM in STEM

There is much research on the disconnection between URM students and STEM education; however, it is equally important to look at ways URM students successfully navigate through those eight systematic factors. Museus et al. (2011b) found six factors that contribute to the success of URM students in STEM fields. These six factors include: parental involvement and support, bilingual education, culturally relevant teaching, early exposure to STEM, interest in STEM subjects, and self-efficacy in the STEM domains. These six factors helped students to become resilient, overcome adversity, and add diversity to the STEM industry (Museus et al., 2011b).

The first factor to be discussed is parental involvement and support in STEM. Parental involvement and support is extremely important for URM students because it emphasizes the purpose of a good education, good study skills, and the importance of having high expectations for themselves. As was mentioned earlier in this paper, students' expectations are critical if students are to succeed in life. Parental involvement is also tremendously important for URM groups because the parents help keep the student accountable for their future (Museus et al., 2011b).

It is understood that some parents may not know how to engage in their child's education and often such parents try to avoid getting involved in their child's education. These situations leave students solely responsible for their own future. In addition, if more URM parents were engaged or knew how to become engaged in their child's future, then they could build a solid foundation for their child in areas that they may want to pursue.

The second factor that plays a crucial role in URM students' success is bilingual education, which plays an important role in URM students' success because research shows that 50% of California Hispanic students start out in classrooms with language other than English (Museus et al., 2011a). Therefore, bilingual education will allow teachers to provide instruction in both English and Spanish for their students to understand the content at a young age. Statistics also show that English learning students typically perform lower on achievement tests than other students because they have to not only study for the test but they also have to figure out the correct translation on the test. Even when compared to minority groups with similar socioeconomic status, English learners perform worse on achievement tests. Therefore, more schools should implement bilingual education for their students to be successful (Museus et al., 2011a).

The third factor that helps URM students do well in STEM is culturally relevant teaching. Researchers showed that in order for culturally relevant pedagogical practices to be successful they must meet the following criteria: developing students' academically, nurturing and supporting students' cultural competence, and developing students' critical competence. Cultural relevance is also important because often math and science teachers instruct from a Eurocentric point of view. Therefore, teachers fail to add approaches that connect curriculum, instruction, and assessment to the experience, cultures, and traditions of URM students. Teachers should be intentional about incorporating culturally relevant pedagogy when teaching URM students in math and science, instead of teaching URM students from a Eurocentric point of view (Khimm, 2011).

The fourth factor that helps URM achieve success in STEM is early exposure to STEM careers. Students who are exposed to STEM careers early generally have more interest in STEM. The earlier students are exposed to STEM fields the greater their knowledge becomes in those fields. In a qualitative study about successful URM engineers, 42 African-American engineers credited their persistent interest in STEM to their primary and secondary school experiences (Museus et al., 2011b). This shows that being exposed to STEM at an early age can positively influence a student's interest in STEM.

Having access and being connected to role models in STEM fields is important for URM students. Having a role model in a STEM career helps URM students visually see someone they look up to in that field and motivates them to learn more about STEM. This theory also holds true for women in STEM as well because very few women have role models in the STEM field, leaving them to believe it is not for women. Early exposure to STEM will increase the number of URM students majoring in STEM and diversify the STEM circuit.

The fifth factor that helps URM students become successful in STEM fields is their interest in STEM subjects. The URM students that possess a strong interest in STEM typically perform better in STEM subjects because they develop a passion for the field of study. These students often have positive role models in the STEM industry and are exposed to STEM fields early in life. The URM students with an interest in STEM fields also stay committed to these fields and go off to college knowing the exact STEM career they want to pursue. Instead of declaring an undecided major, these students already know what they want to do with their career, which gives them more confidence in themselves.

The sixth factor that helps URM students become successful in STEM is the students' self-efficacy. Self-efficacy is key because it creates a sense of confidence within the student. The URM students with high self-efficacy are more likely to do well in math and science because self-efficacy helps their confidence in learning. Confidence while learning gives the student a better mindset and better belief in their work, and it reduces confusion. On the other hand, URM students can sometimes be crippled by their self-efficiency. If students from URM schools have high self-efficacy in high school because they are ranked number one or two in their class in math and science, then encounter difficulties when they go off to college, they may have to adjust their beliefs and behaviors (Museus et al., 2011b).

Women in STEM

Women have been historically underrepresented in the STEM industry, and this is especially true for female URM. Towns (2013) explains why in, "Where Are the Women of Color? Data on African American, Hispanics, Native Americans Faculty in STEM." Towns describes women of color as Asian, African American, Hispanic and Native American women. She states that the lack of URM faculty in STEM has a negative effect on women pursuing STEM careers. The NSF provided data from 1998 to 2007 showing URM women receive more science degrees than URM men, and women are slowly increasing as faculty members in STEM.

The number of URM women with doctorates in academic positions has risen over the past 30 years; however, they only represent slightly over 3% (Towns, 2013).

Information from the NSF was used to study the top one hundred science, engineering, and mathematics programs in the country. After acknowledging the top performing universities in STEM, the department chairs at these top performing universities were asked to classify the universities' tenured faculty by sex, race/ ethnicity, and rank so the researcher could give a breakdown on the total number of women in STEM academia (Towns, 2013). The study uncovered a disproportionately low number of women in STEM academia, compared to men. The findings showed that women were significantly underrepresented in chemistry, mathematics and statistics, computer science, biological science, astronomy, earth science, and physics (Towns, 2013).

Another disturbing finding is the fact that women represent less than 1% of the positions occupied at these institutions. For example, in 2007, out of 44 African Americans employed in the chemistry field only eight of them were women. Moreover, out of 58 Hispanics and eight Native Americans employed at the top 100 institutes in chemistry, only eight Hispanic women and one Native American woman were employed at these institutions (Towns, 2013).

Furthermore, the statistics about women in STEM academia continue to get worse. In 2007, there was not a single Native American female professor in physics, astronomy, computer science, or mathematics in the top 100 performing science, engineering, and mathematic institutions. In fact, Native American women only hold four academic positions out of the 38 total positions held by Native Americans at the top 100 universities (Towns, 2013).

Even though African American women hold a larger number of positions in STEM than African American men, they are still underrepresented by an even larger proportion. Women at the top 100 performing institutions possess only seven out of 64 academic positions in mathematics, six out of 23 academic positions in computer science, two out of six academic positions in astronomy, two out of 21 academic positions in physics, 26 out of 101 academic positions in biological sciences, and four out of 19 academic positions in earth sciences (Towns, 2013). The lack of representation leads to the lack of role models for African American females to look up to in the STEM fields, which may discourage them from pursuing a STEM career and lead them into other careers simply because that is where they see people of color working.

Even though Hispanic women are, statistically, employed in academic positions at a greater rate than other URM, they are still largely underrepresented as a whole. Out of the 74 Hispanics employed at the top 100 performing schools in mathematics and statistics, only 16 were females. In fact, only five Hispanic women out of the 46 Hispanics held academic positions in computer science, and only nine women from a pool of 61 Hispanics held academic positions in physics. Also only 53 out of 238 Hispanics women held a position in biological or earth science at these top performing universities (Towns, 2013). As one of the largest growing populations, it is extremely important for Hispanic students to be educated by other Hispanics and have Hispanic role models in these fields.

Minority Teachers

For years, America has become more diverse; however, the teaching industry has become less diverse. As a result, URM students lack adult minority role models. Further, they come in contact with teachers who do not understand their diverse background as a minority. The shortage of minority teachers is a primary the reason for the minority achievement gap (Ingersoll & May, 2011).

According to a study conducted by, California's De Anza College (Khimm, 2012), blacks, Hispanics, Asians, Native American students are 2.9% more likely to pass a class taught by an instructor of a similar race or ethnic background. The class dropout rate compare to whites is 6% lower for blacks when taught by an African- American instructor. Research suggests that minority students interact positively with minority professors. By increasing the number of teachers in STEM, we can raise the interest of students in STEM discipline.

One reason for the minority shortage in teaching is because too few URM students attend and complete college, and, of the URM students who do complete college, many pursue careers other than teaching. The minorities that do pursue teaching careers encounter barriers before being hired because many minorities struggle with the teacher entry tests, which is believed to be one of the biggest issues in finding minority teachers.

Late in the 1980's, the Ford foundation and Dewitt Wallace Reader's Digest Fund committed $60 million toward increasing and recruitment the number of minority teachers. The initiatives were for recruiting minority teachers to teach in predominantly minority schools and urban school. There were some initiatives for recruiting male minorities; however, male minority teachers are the most difficult to recruit and have the shortest supply to recruit from (Ingersoll & May, 2011).

The U.S. Department of Education conducted a national survey from the 1980's to 2009 on teacher and administrators. The data form the survey showed that minorities constituted 34% of the nation's population and 41% of elementary and secondary school students but only 16.5%

of teachers were minorities. It is important to note that these numbers have persisted due to lower numbers of whites and increasing number of minorities in the population (Ingersoll & May, 2011).

Minority teachers have a higher turnover rate than white teachers. This is largely due to school conditions and location. Hard to staff schools are more likely to employ minority teachers, which contributes to the high turnover rate amongst minority teachers. Salary levels, classroom resources, and the provision of useful professional development have little to do with minority teachers departing minority schools. According to Ingersoll (2011) the main reason minority teachers departed from predominately minority schools is because the lower level of faculty decision- making influence in the schools and the lower degree of individual instructional autonomy held by minority teachers in the classroom. Schools with higher levels of faculty input that provided their teachers with more classroom discretion had substantially lower numbers of minority teacher turnover.

Summary

The research indicates that schools need to do a better job in helping URM in the STEM industries. Findings from the research show that it is necessary that schools provide URM students with the proper programs to help them develop the necessary skills to be successful in STEM careers. Institutions should foster a learning environment that accommodates URM students in STEM.

The HBCU offer their URM students an environment conducive for learning inside and outside of the class, especially mentoring programs which keep their students focused not only on academics but also involved in the learning community. The HBCUs also offer a community suitable for URM students to feel comfortable in the learning environment, which is really important for institutions with low URM population. Finally, increasing the presence of URMs in the profession of teaching will be helpful.

One must remember the eight factors that researchers say contribute to lack of URM students in STEM. Improving these eight factors is very important for increasing diversity in the STEM industry. These eight factors hinder URM students in many ways: school funding disparities, URM schools not offering AP classes, remedial tracking of URM students, teachers' low expectation of the URM students, underqualified teachers in URM schools, stereotype threats, oppositional culture, and early departure of high school for the URM students.

The six factors that contribute to URM students are extremely important to note because historically these six factors have helped URM students become successful. Parental involvement and support, bilingual education, culturally relevant teaching, early exposure to STEM, interest in STEM subjects, and self-efficacy in the STEM domain have all been known to help URM students succeed in the STEM industry.

The lack of women in STEM academia is known to hinder the number of women pursuing STEM careers. Institutions should take into account the need for role models in STEM academia for URM and female students. If institutions would increase the diversity in STEM academia, then the STEM industry would be more diverse as well.

Chapter Three: Conclusions and Recommendations

Conclusion

In summary, schools should address the issues hindering URM students from receiving an equal opportunity for education. By addressing these issues, schools can offer more programing to accommodate URM students and adjust to some of the HBCUs methods of educating minorities. Institutions also have to address the factors that contribute to the low number of URM students in STEM and the factors that aid URM success in STEM industries. Finally, institutions should offer more diversity for women in the STEM academia. Addressing these issues should increase the number of URM students studying in STEM.

Recommendation

The recommendation made in this paper is that UW-Platteville host summer bridge camps called, “STEM is Possible” for students from low income communities. Such a camp would keep students actively learning and keeping information fresh during the summer months. A camp will also help students prepare for their first semester of college, creating a smoother transition from high school to college. The STEM is Possible program should send out mass emails to parent, teachers, and students in low income school districts, inviting them to participate. Participants and their parents would be required to fill out informed consent and liability forms before agreeing to participate.

This six-week summer bridge program will be divided into three two week sessions throughout the summer. The effectiveness of STEM is Possible will be examined at the conclusion of the program. The programming will cover rigorous math and science courses for the participants. At the beginning of each session a pretest will be administered, to measure content knowledge. At the end a posttest exam will be given to assess the potential success of each group and its members. This information will be recorded to track students' progress.

Research shows that the race of the instructor plays vital role in student learning, so staffing for the program will primarily be URM staff. Six instructors will be included, two African-American instructors, two Hispanic instructors, and two Caucasian instructors. This will allow measurement of which students were influenced the most by instructor race.

The first two weeks, the instructors will be African-American. After the first two weeks of the program, the Hispanic math and science instructors will replace the African-American instructors. The introduction of Hispanic instructors will also allow us to see which students learn better from Hispanic instructors. Then the final two weeks the Caucasian instructors will teach math and science. The data we collect will allow us to see the difference, if any, between instructors, the instructors' style of teaching, and the interest of students in math and science based on their instructors.

The parents of the students will be asked to participate in this program as well, since research shows URM students whose parents play an active role in their education are much more likely to succeed in STEM than those whose parents are not involved. Therefore, the participants' parents will be asked to engage in their children's learning experience and career choices over the six-week period of the program. Parents will not be required to attend class sessions but will be required to call and checkup on their children's progress daily. This will not only help the child prepare for their future, but also demonstrate to the parents how to actively engage in their children's future. Parents will agree to set aside ten to fifteen minutes a day to call their children as part of the agreement regarding entry into the program.

It is likely that all participants will benefit from the programming because they will experience being on campus as a learner and will develop familiarity with the academic environment at UW-Platteville. They will also encounter challenging academic material which will give them a boost as they begin challenging coursework when the semester begins. They will experience mentoring from URM students and faculty. Finally, measuring the effectiveness of instructors of different races with different students will shed light on how the University's faculty recruitment, and assignment of students to particular instructors, should proceed.

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