

The Systematic Misuse of Science

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Opportunities continue to grow in the United States for those with specific education in STEM areas; however, there should be great concern among citizens, educators, and experts that African Americans and other underrepresented groups are not pursuing careers in STEM fields, the key to US long-term global involvement (Smyth & McArdle, 2002). Although the demand for science and engineering backgrounds is on the rise, it is troublesome to note that there are fewer individuals seeking these careers (National Science Foundation, 2004b). According to Weiss (2009), a manpower survey indicates that US engineering jobs are difficult to fill by qualified employees. Research confirms that careers necessitating advanced science and mathematics education are not attracting African American interest (e.g., Lewis, 2003; National Science Foundation, 2004a). Atwater, Wiggins, and Gardner (1995) document that many urban students who plan to engage in a science-related career do not take high school science courses in preparation for advanced educational achievements. Researchers and educators are greatly concerned at this profound underrepresentation of African American students in science and mathematics vocations.

The AAAS (1998) reports that over the course of our nation's history, science and science-related careers have been regarded as a privilege of the upper class; as a result, only a small number of African American students achieve success in science (Russell & Atwater, 2005). Although equity, equal opportunity, and fairness are supposedly foundational factors in U.S. culture, that foundation is not consistently the case for African Americans pursuing science credentials. Russell and Atwater (p. 692) write that "although, in the last few decades, African Americans have made significant strides in science and mathematics (Oakes, 1990a, 1990b), their increased participation in the sciences has been miniscule compared with

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Whites.” Twenty years ago, it was observed that White males were becoming less interested in STEM occupations (Johnson, 1992), and for that reason, the United States is now forced to attend to the problem of declining numbers of the majority population as well as to the absence of other groups of people such as African Americans in STEM careers to remain a viable leader in the twenty-first century. With the majority group losing interest in STEM areas and with the lack of African Americans pursuing STEM areas, this trend could hinder the scientific and technological advancements of the country.

To understand why so few African Americans pursue careers in STEM areas, the history of how we got to this point must first be understood. This chapter traces historically the idea of perceived racial inferiority in regard to African Americans and how that label has inhibited the full participation or inclusion of African Americans in science and other human endeavors. Implicit throughout this chapter is the theme of Social Darwinism, because Darwinism was the casing that gave shelter to racialist ideologies that provided the validity, the credence, and the power to convince a nation that the idea of natural selection should be applied to humanity. Most importantly, it gave a scientific foundation for the belief that the structure of society was the way that nature intended. The question that should be asked after reading this chapter is as follows: why would African Americans want to be a part of something that has continuously tried to disenfranchise them and has tried to prove since its inception that they could not think on a higher order?

Science teacher educators should be interested in this chapter as it attempts to explore the discriminatory ideologies that framed science with regard to African Americans, the conceptions that resulted from these foundational ideologies, and the subtleties embedded within the present infrastructure of society that are the residuals of these ideologies in an attempt to show that where we are with regard to African American participation in STEM fields is no accident but are the fruits of the seeds that were planted many years ago. Understanding the history of African American experiences with science has the potential to equip science teacher educators with the ammunition needed to tackle the problem of African American underrepresentation in STEM fields. Knowing plausible reasons as to why a problem exists is the first step in attempting to solve it.

Social Darwinism and a General Overview

Long before Social Darwinism was established, the relationship between race and intelligence had been a subject of conversation among numerous European intellectuals (Dennis, 1995). Social Darwinism provided a foundation that allowed ideas of European supremacy to manifest because it provided a framework that allowed these ideas to rationally function (Dennis). According to Dennis, individuals such as Buffon (1797) and Gobineau (1853/1915, 1995) used this framework to establish

a trend in racist ideology by connecting the pigmentation of a person's skin to their conduct and human capabilities.

Darwin himself used his theories of evolution to explain occurrences within the animal species. He never applied his theories to human beings. It was others like Herbert Spencer that applied Darwin's evolutionary theories to those of the human race. In fact, it was Spencer (1874) who coined the phrase "survival of the fittest," not Darwin. It was also Spencer who believed that the rules of natural selection applied to the human species as well as to those biological species (Dennis, 1995). Spencer believed that humans are guided by rules of opposition and power and that they progress from an uncouth and antiquated condition to one of separation and advancement. According to Spencer, those not able to adjust should by nature's law perish or be beneath those who have adjusted (Dennis).

This doctrine of Social Darwinism promoted racial conflict because the key to social advancement required "a continuous over-running of the less powerful or less adapted by the more powerful, a driving of inferior varieties into undesirable habitats, and occasionally, an extermination of inferior varieties" (Greene, 1963 as cited in Dennis, 1995, p. 244). Darwinism, explained in simpler terms, can be construed as the battle for survival in which competitions between the races occur. In this competition, the fittest or superior will replace the weakest or inferior (Montagu, 1965). Put into these terms, the conflict among the races is justifiable because it supplies a biologically impartial resolution that is neat but most of all natural (Montagu).

The idea of Social Darwinism most notably presented itself in the United States during the antebellum period by the nation's leading Social Darwinist, William Graham Sumner (Dennis, 1995). Sumner situated the ideal of slavery into Social Darwinism and reasoned within this framework that because "slavery permitted superior groups the leisure to construct and develop more refined cultures, it actually advanced the cause of humanity" (Bierstedt, 1981; Dennis, 1995, p. 244). Sumner also believed that the current status of certain groups of people was a result of the natural selection of nature.

Scholars such as Spencer and Sumner helped to create the atmosphere and disposition towards race relations in the United States. In their assessment of society, aptitude and merit were characteristics only identifiable within the European community. Their view, which was housed in the framework of Social Darwinism, also supported the reality of institutional structures that already existed in society.

The Nature of Science in Science Education

Throughout history, humanity has found and developed many interesting theories about the order of the world and about the people who live in it. Some theories have been proven legitimate based on the evidence provided, while other theories have not fared so well. The interesting occurrence, however, is that these theories, legitimate or not, have provided road maps of processes to future generations. The procedure in which these processes are formulated is the foundation that gives

science the credence that renders it unique from other disciplines. The processes of examining, reasoning, testing, and authenticating are all pivotal components in the construction of that foundation, and those components are at the core of the nature of science (AAAS, 1989).

According to Lederman, Khalick, Bell, and Schwartz (2002), “typically, the nature of science refers to the epistemology and sociology of science, science as a way of knowing, or the values and beliefs inherent to scientific knowledge and its development” (p. 498). Glasson and Bentley (1999) write, “the most influential current curriculum documents in science education consider the nature of science as basic content for the K-12 curriculum for all students” (p. 470). Project 2061’s AAAS (1989) and AAAS (1993) are both major contributors to the establishment of the current *National Science Education Standards* (National Research Council [NRC], 1996). These documents establish the nature of science to include three categories: the scientific worldview, scientific inquiry, and the scientific enterprise.

The scientific worldview relays that those who practice science have specified fundamental standards that guide their way of thinking about how they practice and regard science. This line of thought is concerning the nature of the world and what knowledge can be obtained from it. This scientific worldview is supported by four tenets: the world is understandable, scientific ideas are subject to change, scientific knowledge is durable, and science cannot provide complete answers to all questions (AAAS, 1989).

Scientific inquiry implies that every discipline of science, from chemistry to physics to biology, etc., requires evidence to substantiate claims. Although scientists may differ in the process in which their research is conducted, the basic premise of how they conducted that research should be similar. It is that premise which makes research scientifically legitimate. This characteristic is what makes science inquiry based, and everyone, regardless of whether they practice science, could employ these skills on a daily basis on issues of importance to them if they so choose. Scientific inquiry is supported by five tenets: science demands evidence, science is a blend of logic and imagination, science explains and predicts, scientists try to identify and avoid bias, and science is not authoritarian (AAAS, 1989).

The scientific enterprise recognizes that science has individual, societal, and foundational facets. The activity or practice of science, presently, is what separates it from the practices of other disciplines. The scientific enterprise consists of four tenets: science is a complex social activity, science is organized into content disciplines, science is conducted in various institutions, and there are generally ethical principles in the conduct of science (AAAS, 1989).

Even with those three principles established and with those principles being the foundation and framework of sciences’ curriculum within the K-12 system, theorists, philosophers, academics, sociologists, and educators of science are prompt to dispute on particular matters concerning the nature of science (Lederman et al., 2002). Perhaps the reason for this is that it is impossible, or at least very difficult, to define specifically an ideal such as the nature of science, because that nature can take on so many meanings. The nature of science has many sides to it; it is very complicated

and has many layers. Also, the views about the nature of science, like scientific knowledge, are provisional and tentative. Throughout the history of the nature of science, views about it have changed (Lederman et al., 2002 & see Abd-El-Khalick & Lederman, 2000, for a broad survey of these changes).

It may be argued, for example, that science has been used throughout history as a means to separate, classify, and rank things according to some type of order. Science in the past as well as in the present separates everything, the good from the bad, trees from other trees, trees from insects, people from animals, good methods from bad methods, and so on. The very methods provided by Science for All Americans are given to separate good science from bad science to legitimize the scientific process. The question that this raises is: Is the nature of science inherently good or bad given what it has been used for? It could be reasonably debated that science really has no nature at all, because how can something that is inanimate have a nature?

Many talk of science as if it is an entity that lives, breathes, and operates separately from the rest of the world. In that aspect and that aspect alone, science can be pure and objective, but science does not operate in this manner. The science that society has come to know cannot exist independently from the world because science is a tool that takes on the very nature of whoever controls it. Science in essence is a set of principles, established by man, which help to guide man to “pure and objective” science, an ideal that he will never come to know. Science with the involvement of man cannot have one true nature. Given this parameter, the nature of science can be good or bad depending on whose hands control it.

Working on the assumption, for example, that guns were created to kill, it may be asked if the nature of a gun is inherently good or evil. In some hands, a gun kills, and in other hands a gun may serve to protect from evil. The point is that the gun takes on the characteristics or the intent of the person using it. Science can act in much the same way; it can be used for good or evil. Both guns and science have no say in how they are used because both are only tools.

The nature of science, like scientific knowledge, is a concept that is comprised of educated conjectures made by those who practice and study science. Since science is an entity that cannot exist separately from society, a scientist’s opinions, prior experiences, preparation, and viewpoints may have some bearing on their practice (Lederman et al., 2002), and “all these background factors form a mindset that affects the problems scientists investigate and how they conduct their investigations, what they observe (and do not observe), and how they interpret their observations” (p. 501). This is important because many people believe that scientists and their observations are always impartial (Lederman et al., 2002; Popper, 1992), but in reality it may not consistently happen in this manner. This is because science and the practice of it is a societal construct, and practitioners of science are members of this society and can be as given to presuppositions as anyone else (Grant, 1992). “Observations and investigations are always motivated and guided by, and acquire meaning in reference to questions or problems, which are derived from certain theoretical perspectives” (Lederman et al., 2002, p. 501).

The question becomes: can one separate the nature of an individual from the nature of science? Stanfield (1995) argues that science cannot be separated from its creators. He contends that:

Social realists argue that for far too long there has been reluctance to view scientists as human beings with biases derived from their historical and cultural contexts, politics, and idiosyncrasies. They claim that the traditions, institutions, communities, and networks scientists, as cultural baggage carriers, create, stabilize, and transform are sociological and anthropological phenomena. (p. 223)

Stanfield also states that:

One cannot divorce the history of the human sciences from the sociology, politics, and economics of capitol formation. It is this sense that the human sciences, by their very nature are social, cultural, and political and therefore intrinsically biased. (p. 223)

The nature of science has been throughout the course of history both good and bad. It could be reasonably debated that in the case of African Americans, science or the misuse of science has been used to hinder the full inclusion of them into society.

The very nature of science, in the hands of certain persons, excludes and separates, systematically using information to project certain images or beliefs. As a result, general laws are implied within society, not laws that are recorded or spoken, but invisible or implicit laws of social practices, a kind of hidden curriculum (Apple, 1986). Those unwritten, unspoken, and invisible laws imply that African Americans have no worth in this society, are mentally inferior, are second-class citizens, and deserve their lot in life. The nature of science when misused has made those of African descent appear less than they really are.

The History of African Americans and the Misuse of Science

It may be argued that science has been represented as something that is free of personal beliefs and values; something that is uncorrupted, without fault; and something that is above all else, objective. Since the eighteenth century, science has on many occasions been used as a rationalization to recommend, develop, and endorse bigoted social practices in this society (Dennis, 1995). Science does and has always had great authority in society. It is because of the authority given to science that it has had great effect on the attitudes towards the idea of race in society as known in present time. Science, since its inception, has had a reputation of being exclusionary. Science was, and remains, an institution in which not everyone can participate because it was designed to be such. Norman (1998) describes the institution of science in this way:

The institution of science by way of the Royal Society in England and other academies in Europe rendered science a powerful force in the hegemonic projects of Europe. It was the scientific establishment that reinforced the widely held notions that the bodies of women, the lower class, and the colonized were mere "signs" that were to be interpreted and

incorporated into narratives aimed at consolidating as natural and legitimate the position of privilege occupied by European males at the top of the gender, class, and race hierarchy. The almost unassailable position of prestige and influence attained by science through its institution was used to legitimize the tendencies of exclusion and dominance manifested in the wider society. (p. 366)

In order to preserve this institution of privilege, much pure and objective science was conducted in an effort to keep the European male in control of society.

Since the seventeenth century, science has been so esteemed and powerful that it prevailed over all other thoughts that opposed tactics of supremacy and separation. Scientists, because of the esteem and power that science encompassed, were held in high regard in society. During the seventeenth and most of the eighteenth centuries, the works of scientists were deemed indisputable; so without dispute, the scientists' findings about racial inequality were basically unchallenged. Since science was viewed by humanity as a discipline that was incontestable, their assertions about race were accepted by the mainstream (Norman, 1998; Schiebinger, 1989; Stepan & Gilman, 1993). Three reasons can account for the acceptance of these social theories of the time:

1. Science has done a spectacular job in its persuasive declaration to absolute impartiality.
2. Institutional science has been successful in positioning itself outside the grasp of ethical, political, and spiritual examination (Norman, 1998).
3. Science provided clear and precise evidence that showed the natural inferiority of African Americans, as well as women and those from different socioeconomic classes.

It was not until the late eighteenth and early nineteenth centuries that opposition started to emerge, but by this time the damage had been done. The doctrine of racial inferiority had already been allowed to infiltrate the fabric of society. Perhaps through the use of two scientific methodologies in particular, craniometry and IQ testing, scientists managed to use science to really embed the notion of racial superiority of European Americans and the racial inferiority of African Americans in US society.

Craniometry

In the 1800s, scientists such as Carleton S. Coon, Samuel G. Morton, and Paul Broca measured and weighed the human brain to document unequal intelligence between races, and all came to the conclusion that African Americans were inferior to European Americans and that women were inferior to men. Social Darwinism would give theoretical sophistication to the methodology these scientists used that claimed that people of African descent, because of the size of their skull in relation to those of European descent, were not on the same level intellectually as European Americans, and for this reason, their less significant status among society was

merited (Stanfield, 1995). This message was allowed to penetrate society even though these scientists found substantial amounts of evidence that contradicted their original hypothesis.

For example, the average European American's brain that was measured during this time had a volume of about 1,400 cm³, while those of African descent had some 50 cm³ less. What the scientists using this methodology failed to communicate was that the Neanderthal man, Mongols, and Eskimos all had brain volumes that exceeded those of European descent by at least 150 cm³ (Montagu, 1965). Also added to the list of those with greater brain size would be Native Americans, as well as some entire African nations (Montagu) which are an indication that scientist selected what they wanted to report to advance their line of thought.

The fact that none of these findings were discussed in regard to African Americans when such claims were made about them being inferior because of their brain size is not shocking. This is further evidence that indicates that science or scientists are influenced by the social constructs in which they live. This is evident in that scientists neglected to discuss their entire findings because it went against their worldviews about race in this society. The truth is that no one in the past or present has been able to make a correlation between brain size and intellectual ability (Grant, 1992). This is because brain size, skull size, weight, volume, cell number, etc., have no relation at all to intelligence (Montagu, 1965).

Intelligence Testing

In the latter part of the nineteenth century and well into the twentieth century, this ideology of inferiority continued with intelligence testing (better known as IQ testing). This methodology again was used to show that African Americans were not as intelligent as White counterparts and that their position in society was therefore deserved. The tests were used as an extension from craniometry in that scientists wanted to relate smaller skull size, as well as the volume of the brain, to low performance on intelligence tests that were designed. Again Social Darwinism gave theoretical and scientific validity to these methodologies. The IQ tests were used to exclude African Americans from certain fields of work requiring a higher level of thought.

For example, the US Army developed tests to place soldiers in particular lines of duty in World War I. These tests showed that on average, White Americans outscored African Americans, but ironically those African Americans from the North in many cases outscored their White counterparts from the South. One possible explanation for this outcome could be attributed to the conditions in which African Americans of the North lived. The racial climate that African Americans from the North lived in was not as harsh as the environment for those African Americans who lived in the South. In the North, segregation was less prominent, and this allowed African Americans to attend school alongside those of European descent. The results of these tests indicated that environment and opportunity to

learn had more to do with the results on the intelligence tests than did genetics (Hines, 2002).

Racialists did not agree with the finding concerning environment related to African Americans. Scientists such as Professor Richard Lynn of the University of Ulster believed that those with European blood would continually outscore those of African descent. The thought was that the differences in scores were too large to be explained by the environmental conditions in which African Americans lived; therefore, the reason must be genetic makeup (Grant, 1992). The argument was made that those African Americans with higher scores had more European ancestry than those that scored lower and those European Americans who scored lower had significantly more African ancestry. However, regardless of their scores, African Americans were still placed in subservient roles because of their race.

Social Darwinism

To give an idea of how much Social Darwinism was, and to some extent still is, entrenched in this society, Henry E. Garrett, a visiting professor at the University of Virginia, published in 1961 “The Equalitarian Dogma” in *Perspectives in Biology and Medicine*, in which he asserted that holding African Americans to the mental equals of European Americans was the scientific hoax of the century (Synder, 1962). The article received national attention because of Garrett’s reputation within the scientific community. Garrett believed that the idea that all men were born of equal endowments was ludicrous as well as deceptive because he believed those of African descent have never accomplished anything of significance. He contended that the environment in which African Americans lived had little to do with their intelligence and that their scores on intelligence tests were mostly a sign of their genetic composition (Synder). According to Synder, Garrett was under the belief that some in society suppressed evidence of African American mental and social immaturity in an effort to help them. Garrett believed that their efforts were sincere, but unfortunately erroneous, and he referred to these actions as the equalitarian dogma.

Although the findings by these scientists in craniometry and intelligence testing may have been filled with racial prejudices, for many White Americans, these scientific methods only confirmed what they already believed about African Americans: “that there was White ethnic hierarchy, and that this hierarchy, despite differences, stood atop all other races, especially the African American race (Dennis, 1995, p. 247).” Even without the backing of science, there was a real need for White Americans to believe that African Americans were inferior to them, and due to the validation that science provided, even those with low economic status could take solace in knowing that those of African descent were beneath them (Dennis).

Science provided the objective confirmation needed for those of lower economic status to believe, without a shadow of doubt, that at the very minimum they were made better than the “Negroes.” A professor from the University of Virginia was

quoted in 1900 that “the Negro race is essentially a race of peasant farmers and laborers. As a source of cheap labor for a warm climate he is beyond competition; everywhere else he is a foreordained failure” (Perkinson, 1991, p. 42). The misuse of science led persons to think in this manner and promoted a “natural bias toward analysis that glorifies one’s own status groups and deprecates those of others” (Jorgensen, 1995, p. 236).

Slavery

According to Dennis (1995), the science methodologies of that day accomplished two things: “they confirmed White Superiority and they strengthened the idea that Blacks should be excluded from the core culture of American society” (p. 247). These thoughts are still prevalent today because science laid the foundation for these thoughts to manifest through the years, regardless of the fact that science has been recognized to be imperfect and not beyond letting personal biases or agendas into its absolute objectivity.

For example, the South in the 1840s and the 1850s received tremendous pressure from the North to abolish slavery. In order to ease some of this pressure or tension about slavery, the South badly needed a way to justify its position on slavery to the North because at this time, other countries in the world had completely eradicated slavery. Science served as the South’s justification. It was around this time that much of the literature that was discussed earlier in regard to African inferiority and White superiority started to emerge (Dennis, 1995; Oakes, 1982).

In order to justify slavery, those of the South used the Declaration of Independence for its foundation. In *The Idea of Race*, Ashley Montagu articulates how the signatories of the Declaration of Independence did not mean in the biological sense that “all men are created equal” and that “they are endowed by their creator with certain unalienable rights; that among these are life, liberty, and the pursuit of happiness.” It was believed the signatories were speaking from a political sense only, in part because the US Declaration of Independence was by no means intended to represent equal aptitude; its intent was to establish the position that a person within set parameters is entitled to live without restrictions and to realize himself/herself to his/her fullest potential and that a person has the unequivocal right to develop without repercussion.

This view caused those who had the most interest in slavery to prove that African Americans were not biologically, or in any other way equal to them. Because of this, they could not enjoy the rights and privileges granted by the Declaration of Independence to the level of European Americans. This doctrine of racism gained strength through the various scientific experiments like craniometry and IQ testing that were previously mentioned and the various interpretations of those experiments. Science convinced society that it was justified in enslaving African Americans because they were by nature beneath those with White ancestry, were in a sense not human, and were “scarcely capable of mental endowment” (Jorgensen, 1995, p. 234).

According to Montagu (1965), three things were to be accomplished by this doctrine: (1) “To prevent homogenization or magnetization and thus deterioration of the superior race; (2) to keep the races segregated so that each has the opportunity to pursue life, liberty, and happiness within the prescribed limits; and (3) to provide educational and social opportunities for the members of each race according to the limits of their assigned capacities, the superior race, of course, enjoying superior opportunities to those of which the inferior race is held to be capable of taking advantage (p. 45).”

Today’s Messages Regarding Racial Inferiority

Science as a whole still enjoys that cloak of irrefutable exactness that it enjoyed when it was making the claims of the past. The scientists of the past have always claimed objectivity when questioned, and to an extent the scientific community of today invokes that same claim to objectivity, with essentially the same effect when questioned. In 1923 Carl Brigham published *A Study of American Intelligence*, and in 1994 Richard Herrnstein and Charles Murray published *The Bell Curve*. Both publications claimed to be scientifically reliable and completely objective when reporting the findings that European Americans were superior to African Americans and other races of people (Vera & Feagin, 1995).

These two books would probably be of little importance if they went unnoticed, but the fact remains that both sets of authors had an audience. *A Study of American Intelligence* was offensive but understandable due to the time in which it was written and published; however, *The Bell Curve* was totally shocking due to the fact that it was published in 1994, a time when supposedly the use of science was used to unite instead of separate. The message about the inferiority of different ethnic groups was again allowed to permeate through society. That message was the same message that has been with this country for generations and that message is “groups of people should learn to appreciate what they do well and not aspire to other things outside their natural capabilities” (Zappardino, 1995, p. 6). This view is the offspring of the misuse of science, and this perspective has had great effect on African Americans.

The Effects of the Misuse of Science in the African American Community

The status of future generations of African Americans could easily be predicted by some due to the oppression experienced by African Americans of the past. Four tenets given by Jorgensen (1995) depict a realistic synopsis of African Americans, and those realities can and have created a climate of racism in the field of science and in the society as a whole.

First and Second Tenet Discussion

The first and second tenets state, (1) “racial oppression creates negative social facts such as the low economic, political, and social status of the oppressed and its harmful effects on the character of a portion of the oppressed population,” and (2) “the negative social facts that are the consequences of the oppression are used as justification of oppression” (Jorgensen, 1995, p. 235). These tenets are communicated daily about African Americans. In today’s society the suppressors try to hide their continuous study of the suppressed by masking their experiments in social problem approaches. Through these approaches, the misuse of science has validated and reconfirmed the notion that African Americans are mentally inferior by creating an undertone that leads people to draw these conclusions (Stanfield, 1995).

Take, for instance, the “sociological studies of dysfunctional African American families and gender categories, the educational psychological studies of poor African American performance on standardized tests, and the identity pathologies of children of mixed descent to the neurological explanation of inner city African American violence” (Stanfield, 1995, p. 226). In addition, according to Power, Murphy, and Coover (1996), in a content analysis of prime-time fictional programming from 1955 to 1986, Lichter, Lichter, Rothman, and Amundson (1987) found a strong association between crimes, drug trafficking, and African American characters.

Similarly, in a series of studies on reality-based news reports, Entman (1994) suggests that the television news “paints a picture of Blacks as violent and threatening towards Whites” (p. 29). Entman (1994) also notes a “dearth of positive portrayals of African Americans as contributors to American Society.” The negative images place African Americans at a disadvantage. They are not only faced with the challenge of overcoming the expected hurdles for achievement, but their hurdles are further compounded by their struggles to prove their self-worth.

These studies and perceptions of African Americans cannot help but validate the notions of White superiority, White normality, and above all else African American inferiority (Stanfield, 1995). “The historical origins, institutionalization, and transformation of science as sources of racially and ethnically bounded knowledge reaffirms its legitimacy” (Stanfield, p. 224). Society in general is fine with these results because it legitimizes the dominant group position in this society. It gives privileges and advantages in which everyone cannot participate.

The system is a very complicated entity that has maintained its advantage and privilege by destroying the self-efficacy of an ethnicity’s hopes and dreams, causing African Americans to question their value in this society. Those questions guide the journey that African Americans travel in their quest to define themselves. They must wade through images perpetuated in today’s society that are in most cases not positive. In these circumstances, African Americans are forced to maintain vigilance and thus must devote major energy to discerning, preventing, and ameliorating such negative presumptions.

Many African Americans live life, confronting stereotypes that affect their existence. "In effect, stereotyped assumptions greatly determine the salience of African Americans physical and psychological presence in many contexts" (Franklin & Franklin, 2000, p. 45). Their experience, the history of African Americans, and those representations of their race in which they see in the media all have an effect on the psyche of African Americans.

Due to this stigma that science has established and validated about race, many African Americans live their entire lives trying to "refute the degrading, humiliating and offensive racial images and stereotypes" (Yeakey & Bennett, 1990, p. 12) that have plagued their race. The images that are perpetuated have caused frustration as well as aggression in African Americans. To take an entire race on their shoulders truly has an effect on the consciousness of African Americans, especially when "the drive towards achievement and accomplishment that the African American professional inspires is overwhelmed and distorted by the social reality it conceals" (Yeakey & Johnston, 1979, p. 12).

Almost every problem that plagues African Americans can be traced back to the roots of perceived racial inferiority and how the misuse of science helped establish those roots. The roots that were validated by science have developed into what is formally known as racism. The residue of this misuse of science has manifested in the lives of many African Americans.

Racism can be seen, according to Harrell (2000), as:

A system of dominance, power, and privilege based on racial group designations; rooted in the historical oppression of a group defined or perceived by dominant group members as inferior, deviant, or undesirable; and occurring in circumstances where members of the dominant group create or accept their societal privilege by maintaining structures, ideology, values, and behavior that have the intent or effect of leaving non-dominant group members relatively excluded from power, esteem status, and/or equal access to societal resources. (p. 43)

Another author, Tatum (1997, p. 7), believed that racism was "not only a personal ideology based on racial prejudice, but a system involving cultural messages and institutional policies and practices as well as the beliefs and actions of individuals." She further notes "in the context of the United States, this system clearly operates to the advantage of European Americans and to the disadvantage of people of color" (p. 7). The system of privilege that European Americans enjoy oppresses and denies African Americans and other ethnic groups of those unalienable rights that are dictated in the Declaration of Independence.

Studies report the connections between the impact of racism on African Americans and their social and physical conditions (Franklin & Franklin, 2000; Gordon, Gordon, & Nembhard, 1994; Leary, 1996). These studies analyze the degree to which the complicated and frequently pathological state of affairs unconstructively affects the development, self-identity, and self-esteem of African Americans (Gordon et al., 1994). African Americans are psychologically injured by their demoralized standings and treatment (Kardiner & Ovessey, 1951).

In the system of advantage, those in power set the parameters in which those without power operate, meaning that the individuals in power have a large

amount of control in shaping the structure of society. The structure of society places African Americans at a disadvantage because their predetermined positions have devalued significance due to implications such as African Americans being considered throughout history as less intelligent than European Americans, or incapable of performing in high cultural capital professions such as science. This line of thought is embedded so deeply in this society that African Americans may internalize the representations or images that the dominant group holds about them, making it challenging for them to have faith in their own ability (Tatum, 1997).

Each generation of African Americans throughout history has experienced obstacles that they had to overcome. Those generations that follow have the history of those that came before them and the present circumstances in which they now live. The effects of having experiences that include overcoming racial obstacles and operating in a system that was designed to keep them in place leave a people feeling invisible or not of worth because the cycle of injustice repeats itself.

In this society many messages are conveyed about African Americans. Images and information that have been made popular by the media can easily be interpreted to mean that African Americans are lazy and unintelligent. From these depictions, many believe that African Americans deserve the secondary status that they hold in this society. Society, for the most part, has absolved itself of the responsibility for the negative state that many African Americans may find themselves.

Third and Fourth Tenet Discussion

The third and fourth tenets relay that (3) “in addition to oppression justifying itself by blaming the negative social consequences on the nature of the oppressed, oppression justifies itself by ignoring positive social facts about the oppressed” and (4) “oppressors must always find a way to scientifically and morally justify their oppression” (Jorgensen, 1995, p. 235). An argument can be made that no matter how much advancement is made by people of color, oppressors will always find ways to hinder their progress. The misuse of science has validated and laid underpinnings for the justification of racial oppression.

Although many African Americans have been successful at doing and using science, science and African Americans have been at opposite sides of the spectrum for many years. While the misuse of science has been used throughout history to attempt to show the mental inferiority of African Americans their survival through over 400 years of oppression counter ideas of mental inferiority with very little success at changing beliefs. If any of the assertions made by science were true, African Americans would not have made any advancement since slavery. Thus the use of science has essentially violated and misrepresented the identity of African Americans in an effort to maintain and sustain a system of privilege for White Americans. It can be debated that African Americans are in a

no-win situation because even when they operate by the rules that White Americans establish, their accomplishments essentially are belittled and twisted into other evidence of their insufficiency.

What if the social structure of society actually dictated that African Americans could not participate fully within this society? If society was arranged in a way that primarily benefited those that possessed certain characteristics, could society blame African Americans for their current situation? Turner (1984) believes that oppression is the result of the following conditions:

1. "When a social system reveals populations that are biologically, culturally, and/or socially distinguishable
2. When one population perceives another as a threat to its well-being, particularly when (a) There is competition over scarce resources, and (b) Political leaders need to unify a population by focusing on a common enemy
3. When populations possess vastly unequal degrees of power; and
4. When discriminatory actions can become institutionalized in specific social structures and in cultural beliefs that legitimate these structures. (p.7)"

If these conditions are met, which they are in this country, then according to Turner (1984), oppression will take place.

The need to suppress certain groups of people makes it clear that privilege can be obtained by the suppressors, so much so that in order to maintain this sense of entitlement, the suppressors must condemn the aptitude of the suppressed even though the actions contradict what the suppressors believe is ethically correct (Dennis, 1995). The actions and practices of the suppressors are in complete contradiction to the "fundamental yet abstract antiracist moral principles embodied in the U.S. Constitution and Declaration of Independence and the virulent racism evident in American social practice" (Jorgensen, 1995, p. 234). Knowing these actions were and are ethically and morally wrong, the assumption can be drawn that power (political, social, and economic) can be gained by maintaining the suppressed in substandard places in society (Dennis, 1995).

Conclusion

The misuse of science has created a system of privilege that has over the years guaranteed, as a whole, White Americans control and success in all aspects of life in the United States. Science has, through its systematic arrangements of truths, managed to create a system that separates and oppresses those who do not possess the same skin color as White America. "A science that is the reflection of a White ethnic-dominated, race-centered society that creates and nurtures it cannot help but view non-White others in a lesser light than those who are given, by virtue of skin-color privileges, divine qualities of superiority" (Stanfield, 1995, p. 229). All underrepresented groups are affected by this system of privilege, but African

Americans are the primary beneficiaries of all the hate and bigotry that exist in society. With regard to African Americans, the misuse of science has allowed a system that lacks parity and equity for all to be established and maintained.

This chapter will end by asking the same question with which it started: why would African Americans want to be a part of something that has continuously tried to disenfranchise them and has tried to prove since its inception that they could not think on a higher order? We know that African American students are just as competent as any group of students in achieving in STEM fields, but society has told them repeatedly that they are not capable and has even used “science” to prove that they are not. These actions and these messages have through the years led many African Americans and others to believe that STEM is beyond their intellectual capabilities and just not for them. In order for change to occur, science teacher educators must first answer the question as to why African Americans should pursue STEM professions for themselves. They must then recognize the critical role they play in assisting more African American students to answer the question in a manner that encourages them to pursue and persist in STEM fields. Science teacher educators at every level must recognize that an increase in African American participation in STEM is dependent on them as they are the gatekeepers to the profession. Again, recognizing why a problem exists is the first step in solving it.

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