

Exploring Black Female Post-graduate Science Students' Experiences and Understandings of their Intersectional Identities

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Abstract

Black women face oppression in various fields but research indicates that black women in the science, technology, mathematics and engineering (STEM) fields face even more scrutiny. Black women belong to two oppressed groups – black and women – and therefore face discrimination on multiple levels. This article, underpinned by the theory of intersectionality, explores ten black female postgraduate science students' experiences and understandings of their intersectional identities, and interrogates the implications of their views in this era of women's rights and feminism. Interviews with the students focused on their experiences in their degree, knowledge of their intersectional identities, and understandings of their professional career trajectory and was analysed qualitatively. The study found that these students were a bi-product of their schooling socialization and the influence of their science discipline, prompting the authors to question whether transformation is occurring in higher education in South Africa or if classism is now the new 'racism'. Further, the implications of entering the workplace, whilst holding outdated patriarchal views, are interrogated.

Keywords: intersectionality, black women, science, transformation

Introduction

Black women face multiple oppressions, including those of race, gender, culture, and class, which make their identities intersectional. Literature has

shown that black women in traditionally white male-dominated fields are discriminated against based on their race or gender, or the combination of both, and their intersectional identities have a direct impact on their progression, or lack thereof, in their professions (Archie, Kogan & Laursen 2015; Ayre, Mills & Gill 2013; Carlone & Johnson 2007; Glass, Sassler, Levitte & Michelmores 2013; Hunt 2016). Despite a long history of obstacles facing black women in South Africa, together with instances of overcoming them, there is a phenomenon occurring at a university in South Africa, where black, female postgraduate science students appear unaware and dismissive of their intersectional identities and the impact those identities will have on their career trajectories.

Existing literature has focused on black men and their experiences in white male-dominated disciplines (Gasman, Nguyen, Conrad, Lundberg & Commodore 2016; McGowan, Palmer, Wood & Hibbler 2016; Roach 2001; Noguera 2003), and there is limited literature (Hirshfield & Joseph 2012; Liccardo 2015) which is dedicated to researching black women's experiences in high stakes disciplines, such as science. In addition, while much research has been conducted in America (Blickenstaff 2005; Carlone & Johnson 2007; De Welde & Laursen 2011; Ong 2005), there is a deficiency of studies in South Africa on black South African women scientists.

Women scientists have attracted attention from researchers in different fields such as psychology (Ayre *et al.* 2013; Legewie & DiPrete 2014; Archie *et al.* 2015), social culture (Archer, Dewitt & Osborne 2015; Charleston, George, Jackson, Berhanu & Amechui 2014), education (Brand, Glasson & Green 2006; Fordham 1993; Wilson & King 2016), and science (Figueroa & Hurtado 2013; Grossman & Porche 2013; Johnson 2007). Some studies have focused on: the reasons why women are not pursuing careers in science; girls' negative attitudes towards science; the absence of women scientist role models; the pedagogy of the science disciplines which privileges male students; the hostile climate for women in science classes; the cultural pressure on women to conform to traditional gender roles (Blickenstaff 2005).

This article explores why black female postgraduate science students in a South African university deny their intersectional identities, which could have an impact on their career trajectories in their science career. The article delves into ten students' understandings of their intersectional identities, and the implications of holding outdated patriarchal views in this era of women's rights and feminism. The authors question how transformation may be claimed

by the institution if only certain students from particular schooling backgrounds are permitted into science postgraduate programmes. The findings lead the authors to question if classism is the new 'racism' in South African higher education.

Theoretical Framework

Anti-racist theories largely focus on black men (Crenshaw 1991; Hill Collins 2000) whilst anti-sexist discourses generally focus on white women (Crenshaw 1991; Evans-Winter & Esposito 2010; Smith 2013), and both discourses often ignore black women and their unique identity of being members of more than one marginalized group. Feminism is only prefixed by 'white' when it is being problematized such that feminism pertains to white middle-class women and as such it is universalized (Young 2000). McCall (2005) states that it is impossible to understand a black women's experience from studies of gender combined with studies of race because the former focuses on white women and the latter on black men. Thus, there are theories that, while useful in parts, do not truly reflect African women's realities.

This paper uses intersectionality as a theoretical grounding, with a clear acknowledgement of its western origin and the complexities of intersectionality that often make it difficult to identify whether race, gender or class are being privileged (Young 2000). As a concept, intersectionality is ambiguous and open-ended, as new intersections, connections, and previously hidden exclusions become known. By 'asking another question', you may tease out linkages between additional categories, explore the consequences for relations of power, and decide whether you need to ask yet other questions (Davis 2008).

While the term intersectionality was coined by critical race theorist, Crenshaw in 1989, the concept has been around for some time (Jordon-Zachery 2007). Crenshaw (1994) used intersectionality to call attention to how the intersection of race, gender and class result in injustice for black women, through what Hill Collins (1990: 221) calls the 'matrix of domination'. Intersectional paradigms remind us that 'oppression cannot be reduced to one fundamental type, and that oppressions work together in producing injustice' (Hill Collins 2009: 21). For example, men and women can experience racism differently, just as women of different races can experience sexism differently

(Gillborn 2015). Cho *et al.* (2013: 799) argued that, ‘What makes an analysis intersectional is the way of thinking about the problem of sameness and difference and its relation to power’. Evans-Winter and Esposito (2010) attest that the intersection of race, class and gender yield unique experiences for women of African descent, and Young (2000: 54) points out that black women’s gender is constituted and ‘represented differently according to [their] differential locations within the global relations of power’.

Feminist theorists have debated for years about the categories of intersectionality – should it focus on theorizing identity and uncovering vulnerabilities and exclusions, or should it be a source of empowerment (Davis 2008). Other theorists (Ludwig 2006; Knapp 1999; Skeggs 1997) have argued that the endless proliferation of differences makes intersectionality weak. However, Davis (2008) contends that the ambiguity and incompleteness of the theory allows it to thrive.

The authors of this article recognise the need to apply intersectionality historically and geographically to the South African context, by noting that in the African context, black women might have to battle their African¹ culture as a form of oppression. Culture forms our beliefs and we perceive the reality that it manifests (Anzaldúa 1987). Dominant paradigms, predefined concepts that exist as unquestionable and unchallengeable, are transmitted to us through culture. Culture is made by those in power, usually men (Anzaldúa 1987; Mkhize 2011). While men make the rules, the women transmit them (Anzaldúa, 1987). This is especially prevalent in African culture, where women are the main agents of cultural inculcation, and where it is mainly women who in the end, perpetuate culture – more so than men. The authors of this article recognise intersectionality as integrating culture as a level of oppression experienced by South African black women who are often passive reproducers of culture based on their position within their families (Young 2000). Ultimately, patriarchy is a global factor that affects girls, especially black girls (Makunga 2017). Thus the authors acknowledge the complexities when using an intersectional lens, and this study attempts to add to the literature by adding a different context, and expanding the theory by highlighting the experiences of black female postgraduate science students and their intersectional identities in a traditionally white male dominated field.

¹ African culture in this paper means Nguni culture which includes isiZulu, isiXhosa and Ndebele cultures and traditions.

Literature Review

This section considers how gender is constructed both generally and specifically in science. It then unpacks issues of transformation at South African universities.

Constructions of Gender, and Gender in Science

According to Gasant (2011), gender is the social and cultural differentiation of the sexes, which changes as the demands of society change. The construction of gender is dependent on intersectional social variables such as race, ethnicity, religion, class, and language (Gasant 2011). Forms of intersectionality create unique situations of disadvantage and marginalization, such as women continuing to be discriminated against in terms of earning power in professions, despite having the same level of education, skill and productivity as men (Shields 2008). Thus, gender constructs and maintains the subordination of women to men, across time and culture (Lorber 1994). Makunga (2017), who conducted research on gender and perceptions of science as a field of study in South Africa, found that children's ideas about gender and their intellectual capacities are formed by the age of six. This implies that being advantaged offers more than avoidance of disadvantage or oppression. It actually opens up access to rewards, status and opportunities unavailable to other intersections.

In South Africa, black women are oppressed as well as 'advantaged' in terms of affirmative action policies (Liccardo 2015). The history of Black women in South Africa as initiators in the transformation of South African society and culture recognises that they are not mere marginal, nameless bystanders. They have been involved in the resistance and fight for democracy in South Africa on many fronts including, among others, their involvement in the Women's March of 1956 to protest the introduction of Apartheid Pass Laws for women and to advocate for women's basic human rights; the anti-pass Sharpeville protests of 1960; and the Soweto Uprising of 1976 against unequal, unjust educational policies. Black women in South Africa fought for community and human rights against an oppressive regime, alongside men, and continue to fight for these rights, including gender equality, today.

In terms of science and science-related fields, there have been a number of undergraduate and postgraduate programmes in recent years that encourage women to enrol for STEM (science, technology, engineering and

mathematics) subjects (Makunga 2017). While there are, more or less, equal numbers of males to females entering undergraduate science-based degrees, at the postgraduate level, men outnumber women in science-based degrees (Makunga 2017). Makunga (2017) suggests that role-models may be important to serve as mentors to young female STEM graduates and provide a supportive network to ward off women scientists' feelings of being isolated and underrepresented in their STEM fields. However, Makunga warns that mentorship should be a personal, not mandatory, choice, as there never should be a suggestion that women need more help than men need to succeed. In science, structural obstacles such as sexism and androcentrism are the real causes of the marginalisation of women (Harding 1991). Feminist critics note that the manner in which science is done needs to change, not only to promote more women in science, but also to question and challenge the logic and foundations of science as a discipline, a discipline that gives science a male image (Gasant 2011).

Makunga (2017) suggests possible solutions to the underrepresentation of women, especially black women, in science should include the media representing and highlighting black women scientists to counter the stereotypical image of a white man being a scientist. Society, too, could counter stereotypical images of women who want to pursue science as a discipline and/or career. Gasant (2011) notes, that education is a site where the reproduction and legitimisation of normative gender roles and power inequalities are reflected in society.

Women in science assume risks for crossing familiar, comfortable gender boundaries (Ong 2005). According to Ong (2005), appearance has an immediate and powerful effect on perceptions, and 'acting like a man' can carry high risks and does not always lead to greater acceptance, since women are subjected to, and judged by, both standards of femininity and standards of scientific competence. A woman who is very 'feminine' is viewed as less competent and a woman who is 'masculine' is seen as unnatural and deviant. The 'masculine' woman typifies the schema for the successful professional, but does not match the schema for women (Ong 2005: 594). A women's gendered appearance is used as a cue about her career in a way that a man's gendered appearance is not (Banchefsky, Westfall, Park & Judd 2016). Studies in engineering (Cadaret, Hartung, Subich & Weigold 2017; Hunt 2016; McGee, White, Jenkins & Smith 2016) also echo the same sentiments pertaining to appearance and femininity.

Yet, black women are sought-after in the STEM fields because they belong to two marginalized groups, race and gender. For transformation goals, they are paraded as symbols of transformation that are coveted, especially in traditionally white-male dominated fields (Liccardo 2015). However, according to BusinessTech (2016), white male professionals out-earn their female counterparts by 42% and black male professionals out earn their female counterparts by 17% (BusinessTech 2016: 1). Even though black women are actively recruited, they are still discriminated against as they continue to earn less than white women and black men (Liccardo 2015). If science continues to be dominated economically by white males, it sends a message to young aspiring black female scientists that the science field is not for them.

In terms of the transformation of the science field, Williams (2015) notes that there is a misconception that filling the science pipeline with people of colour will transform the system. On a practical level, the way science is taught, how it is taught, and by whom, all play a role. In the South African context, which is characterised by a history of gender and racial discrimination, the authors of this article reflect on why black female postgraduate science students at a South African university do not acknowledge such discrimination and deny their intersectional identities. Within this context, the authors consider the influences of intersectionality on science, which needs to be viewed against a history of racial segregation, social engineering, and power relations stemming from pre-democracy apartheid policies and socio-economic factors (Gasant 2011).

Transformation in South African Universities

In apartheid South Africa, the schooling system and higher education policy framework were shaped along racial lines. The Bantu Education Act (Act 47 of 1953) provided black students with an inferior education whilst privileging white students. The Extension of University Act (Act 45 of 1959) made it illegal for blacks to enrol at 'whites only' universities in South Africa. If black students wanted to attend a 'white' university, they applied for permission from the Minister of Education who decided on the granting of a permit. The Minister of Education during the apartheid era refused to grant permits to black students seeking to enrol in engineering, science, medicine, law and accounting, on the basis that there were no prospects of employment for them (Gordon 1981; Harrison 1981). The dawn of a democratic South Africa saw

the change from overt racism to covert racism in the higher education landscape in terms of who is able to access such education.

In the present study, the university, in which the study is located, has a transformation charter, the objectives of which are to promote African scholarship, free from discrimination based on race, gender, ethnicity, religion and class. However, the black female students were from a particular advantaged socio-economic class, which was evidenced from all of them having attended former 'Model C' (formerly white, better resourced, and more expensive schools) or Private (privately owned and run and expensive to attend) schools. It is highly probable that they have been socialized into a middle to upper-middle class schooling. These students come from an 'advantaged' socioeconomic background, highlighting a flaw in the university's goals of transformation. It begs questions such as: What kind of transformation is occurring? Is this real transformation or 'window-dressing'? Is this form of transformation a new type of discrimination based on class? These and other questions will be considered as the implications of the study are considered.

Class, a category of intersectionality, may be used as a form of oppression; individuals may be oppressed due to their race, gender, or ethnicity, but if they belong to the middle to upper classes, they have access to certain privileges they ordinarily would be denied if they did not belong to that class. In addition, Makgoba and Seepe (2004) argue that South African universities require institutional transformation that will provide for the production of knowledge that recognises and critically engages with the African condition as historical. Further, Odora Hoppers (2005: 8) highlights that '...indigenous knowledge is marginalised, denigrated...this systematic subjugation has given rise to cultural racism...while promoting a denial of identity, epistemological disenfranchisement and the strategic disempowerment of African people and communities'.

Research Methodology & Methods

This study, which emerged from a larger project, employs a qualitative research methodology within a critical framework. Qualitative research is characterised by an emphasis on rich description, understanding and explanation of complex phenomena (Creswell 2009). A critical framework is a communal process involving the presentation of the participants' realities

from their own viewpoints, the role of the researcher as a co-creator of meaning and the types of knowledge frameworks or discourses informing that particular society (Henning, Vans Rensburg & Smith 2004). This communal process is in line with the focus of this study, which is to gain a deeper understanding of the denial of intersectional identities of black female postgraduate science students. A critical framework was appropriate for this study because of the understanding that within a critical approach, there is more than one truth and this framework encourages people to be more critical of their reality and could empower them to change their environment.

Reflexivity of the Researcher

Reflexivity can make the researcher more aware of asymmetrical or exploitative relationships but it cannot remove them. As such, England (1994) stresses that as researchers we need to locate ourselves in our work and reflect on how our location influences the questions we ask, how we conduct our research, and how we write our research (England 1994). The primary researcher, as a young, educated, black, woman was aware of her positionality. The participants may have found many similarities with the primary author and therefore may have been willing and open to give truthful answers as opposed to if the researcher was of a different gender or race. Commonality may also have its limitations such as perhaps stating what the participants think the researcher wants to hear or by being more agreeable.

Sampling

The study began through access to one black female masters science student being interviewed, which then led to snowball sampling, because participants would recommend other potential participants, thus growing the sample (Creswell 2009). There were ten participants included two PhD students, six Masters Students and two Honours students. The researcher had access to one science laboratory at the university and used snowballing sampling by interviewing students who utilized that laboratory. Snowball sampling proved both convenient and time-saving. It was convenient because the researcher had access to that laboratory through a student who utilized it, and the students who used the laboratory were interested in participating in the study. Thus, the

researcher did not actively recruit the students; the students volunteered their participation. The students were all African students and their ages ranged from twenty-four to thirty-five. All the students went to former Model C or Private schools. Of the ten students, three came from lower socio-economic backgrounds, but had attained scholarships to attend private schools. The students signed an informed consent form, which guaranteed confidentiality, anonymity, and choice to participate, and full ethical clearance was obtained. Participant's names and identities were replaced with pseudonyms to enable anonymity.

Methods of Data Generation

The researcher employed in-depth interviews over a period of six months in order to elicit rich qualitative data. Open-ended interview questions enabled the participants to reflect on and give detailed accounts of their secondary schooling and university studies. The questions began by asking about their biographical information, how they became interested in science, what they understood about their intersectional identities, and if those identities would affect their career progressions or not. The interviews, which were recorded using a tape recorder, were transcribed manually² and responses were analysed thematically.

Analysis

Thematic analysis was used in this study. Thematic analysis incorporates methods that may be independent of theory and epistemology, and may be applied across a range of theoretical and epistemological approaches (Aronson 1995; Braun & Clarke 2006; Hammersley 2015). This form of analysis is able

² This process involves the researcher taking voluminous amounts of information, reducing it to certain patterns, categories or themes, and then interpreting this information by using some schema. Creswell calls this 'decontextualization' and 'recontextualization'. This process results in a 'higher level' analysis 'while much work in the analysis process consists of 'taking apart' (for instance, into smaller pieces) the final goal is the emergence of a larger, consolidated picture' (Creswell 2009: 154).

to provide rich, detailed and complex accounts of data (Braun & Clarke 2006; Aronson 1995). Thematic analysis was useful for the study because it helped to identify themes that would have been meaningless if read alone. Interrogating the data further presented new sub-themes that the researcher did not initially think would occur.

Limitations

As resourceful as in-depth interviews are however, they can also be limiting in the sense that the respondents' verbal answers to questions may actually be different from what they practice in reality. The researcher attempted to overcome this limitation by engaging with the participants and probing further into their answers to elicit hidden meanings and to gain clarity into their answers to ascertain if they were truly what they had meant or if they were implied.

Validity

The findings were verified by the participants and some participants, after further engagement, reassessed their initial answers and added other information, which they had initially considered irrelevant or insignificant. The participants were debriefed by prolonged engagement and discussions about the findings. The findings were potentially transferable because there is enough thick description of the findings to engage in further probing. The findings are considered dependable because the researcher kept a credible audit of the processes used and the techniques utilized.

Discussion of Findings

While many themes emerged from the data, this article focusses on four main themes.

Biological Identity vs. Professional Identity

I went to a private all girls' school and we were taught that if you wanted to be anything from a theoretical physicist astronaut,

professional tennis player or a housewife, you could do it regardless of your race and certainly not your gender. We were taught you could do anything a man can do, so do not let your race or gender hinder you in reaching for the moon because you could land on a star. (Honours Student 1)

The honours student raises a point that is salient in multicultural private schools. The student is ‘born free’ meaning, she was born after South Africa became a democracy and the whole country was embracing the so-called ‘Rainbow Nation’ of unity in diversity. The student also highlights that she was from an upper social class in that she attended a private school and had the very best resources at her disposal. The student remembers that they were socialized to not give credence to their race or (more especially) gender, and thus, in essence, ignore their intersectional identity. It appears as if the student understood that gender might be an easier hurdle to overcome, rather than race (*certainly not your gender*), somewhat of an understanding of the pervasiveness of racial barriers. Their class socialisation made them believe that they might accomplish anything to which they put their minds.

Class plays a pivotal role in an individual’s access to opportunities. The fact that this student went to a private school implies that she is possibly wealthy, and consequently, she has access to much better resources (teachers, support systems and academic opportunities) than other students in rural and government schools do. While such empowerment is laudable, once these girls leave their protected, cushioned bubble of high school, the real world might look very different. Literature (Hirshfield & Joseph 2012; Liccardo 2015; McPherson 2017) shows that black female students face discrimination in higher education institutions especially so in disciplines that are traditionally white and male, such as science. Black students have to work twice as hard to be acknowledged and are often overlooked for promotion because of their race and gender. Black women have to fight invisible barriers constantly to progress in the science field.

The student above appears to believe that her hard work alone will advance her in their science career, which may be a result of her upbringing and contextual socialization. The student may also have other experiences, which may influence her beliefs in this individualized concept of self-belief and hardworking being the guaranteed way to a successful career whilst ignoring other structural and societal obstacles. Literature on the other hand

disagrees and states that regardless of their hard work and accomplishment, they cannot escape discrimination.

Science Identity Foregrounded and Backgrounded

A second Honours student had initially stated that categories of race and gender are insignificant in the science discipline but then noted that certain individuals seem more '*privileged*' than others. She explained:

Race and gender might be seen as petty problems but there have been instances of 'privilege' in the lab. There is this white boy in our year (Honours) and he seems to come and go as he pleases and does whatever he wants. When I or another Indian woman are late or leave the lab early, we are reprimanded yet the white boy is not. I don't know if it is because he is white or because he is male or because he is a white male but we all know that he has 'privileges' (Honours Student 2).

In the above quote, the student seems aware that the white male student is 'privileged' but is unsure if it is because he is white or male, or both. As intersectional theory points out that race, gender, and their combination to have a compelling influence on behaviours, this example points out that certain people are privileged because of their race, gender, or combination of both. The literature cited highlighted that science is still a white male dominated field and black women are viewed as 'invaders' of traditionally white spaces by disrupting the status quo of science being white and male. Thus, the student's noticing of the white male's privileges not extended to her or her female colleagues, highlights an insidious unwelcoming message being sent by the science department to black (both African and Indian) female students.

It becomes clear that although the student may initially have thought that issues of race and gender are inconsequential in the science discipline, those issues seem to be prevalent. Therefore, the data reveals that although this student initially denied that her intersectional identity plays a role in her science field, she is aware that certain individual's identities seem to garner them more privileges. Although the student initially was unaware of her intersectional identity, by further probing, she became aware that it is because of her intersectional identity, that she is not extended certain privileges. She

also realises that the lack of privileges is similar to others like her (*another Indian woman*), and the enjoyment of privileges is accorded to others not like her (*white male*). However, the status quo, as represented in this example, is being perpetuated by a person of authority within the science field. The status quo appears not to be questioned overtly.

Normalizing the Abnormal

There is a rule in the lab that you are not allowed to wear skirts and open-toe shoes. The reasons are that we work with dangerous chemicals and they might get on the females' legs or to exposed toes. I do not think the rules are discriminatory because it is about safety. Just because the females are the ones more likely to wear open-toed shoes and skirts does not mean the rules or scientific department are sexist (Honours Student 3).

The *rule*, Honours Student 3 highlights, on the surface, is benign and is emphasized for safety reasons. It is interesting to note that the clothing items banned from the laboratory are gender specific to females, and not necessarily to males, and this might be recognised as obvious sexism. The clothing rule might be a way of conditioning female scientists to adopt the masculine dress-code in order to fit into a field that was designed for and still dominated by men. In this field, the women are guided to adopt masculine dress, behaviour and attitudes in order to succeed. The females have to adapt to the environment, not the other way round. One needs to ask if there are other ways of achieving safety in the laboratory without denying the female scientists their individualistic dress styles. This research was solely focused on the experiences of female students and a possible limitation to this study could be that we did not enquire further about what the dress code was pertaining to male students. This might have added an interesting dimension to the complexity of the dress code in the laboratory.

The repeated use of the word *rules* underpins the student's understanding of the norm. Critical race theorists argue that racism (and the authors add, sexism) remains hidden under the veneer of normality (Delgado & Stefancic 2000). Literature (McGee 2016) argues that black students in

science have to change their clothing and their sense of style to integrate and be taken seriously in the field. According to McGee (2016), black science students have to act upon a type of social performance where they negotiate their racial stereotypes by changing their appearance and the way they speak English, and mimicking white behaviours in order to situate themselves as socially and academically acceptable.

The fact that the student does not recognise, and is not made aware of possible structural and institutional obstacles, is problematic and may prevent her, and others, from progressing in their science careers. At universities, students encounter diverse people also pursuing their particular field. When they graduate, however, especially in the sciences, they might be the only black person or black woman in their field. When they enter spaces where the 'norm' is a white male and they are not, how will they be able to cope with institutionalised forms of racism and sexism?

Rejection of Race and Experience of Race

My race or my gender or the combination of both has nothing to do with my scientific career. I do not think in this day-and-age that such things matter. In science, you either know how to do the experiment or not. You're either a scientist or not. You cannot be promoted because of your race or your gender and are clueless about science. You get to where you are by sheer hard work and dedication, not your 'intersectional' identity (PhD Student).

No, absolutely NOT! My intersectional identity has nothing to do with my science degree. Science is a complex field, it is constantly evolving, and you have to be on top of the changing concepts and ground-breaking discoveries. My being a black woman has no bearing on my career trajectory. I will succeed based on my hard work not because I am a black woman (Masters Student).

The masters and PhD students completely deny that their race or gender will have any impact in their science career. This contravenes the literature, which states that gender and especially race play a pivotal role in black

people's advancement in science fields. Black female students in the science fields may believe it is only their *hard work* and *dedication* to their science career that will determine their success. However, these students might have certain opportunities solely because they are black and women in STEM fields. Therefore, while they deny that their intersectional identities have no bearing on their advancement, they fail to recognise that their intersectional identities have a direct bearing on the opportunities to which they have access because of governmental transformation policies and programmes.

The students deny that their intersectional identity will hinder their progress in science but it is this denial, which highlights how intersectionality may not be complete. This denial could point to the need for an additional category in intersectionality theory, that of a 'professional identity'. The students above believe their identities are those of a professional; therefore, they cannot be prevented from advancing because of their race or gender because they dismiss their significance in the science field. These students refute their intersectional identities and do not believe they have a bearing in science. The students believe that their professional identity of doing *sheer hard work*, *having dedication* and being *on top of the changing concepts and ground-breaking discoveries* will prove most important in their career and other categories are obsolete. Thus, it might be time to recognise how intersectionality is constantly evolving (Davis 2008) and that an individual's identity may not completely fit the expected mould of the theory.

The above responses seem to suggest that the more advanced the individuals progress in academia, the more vehemently they deny their intersectional identities. One wonders what accounts for students buying into an ethos of science over an understanding of an identity. Why are students at a lower level slightly more aware of their intersectional identities? One may surmise that perhaps, as an individual graduates into the higher levels of the science degree, they focus solely on their work and have little contact with other scientists. Another possible explanation could be that these students are pushing back against the assumption that they have graduated to this level of science based on affirmative action or any 'special treatment'. That question is beyond the scope of this paper but the answer deserves further probing in future research.

Although the denial by the students of their intersectional identities could be viewed as an 'advantage' in that they believe their hard work and

dedication to their work will guarantee them successful careers, it is also a disadvantage because the literature states that when these women enter the workplace, they will face invisible barriers such as racism, sexism and even classism, so their professional identities alone will not be able to shield them from those obstacles.

Concluding Thoughts

South African universities have been progressive in trying to attain the goals set in their transformation charters. Despite the well-intended principles, goals and values embodied in their policy frameworks to bring about transformation and social cohesion, some universities, because of their institutional cultures, are not ready to accommodate issues of diversity and appear unprepared to promote equity outcomes (Badat 2010). While universities have been proactive in recruiting black students, especially black female students, into disciplines known as scarce skills, such the sciences, they need to reflect on their possible complicity in the structural practices that marginalize underrepresented black students in science. The authors contend that if the universities rely on the limited pipeline of private and former model C schools to supply them with black female science students, then they might be short-sighted.

Black female students in the STEM fields are taught white hegemonic knowledge, which ignores oppression. They therefore internalize this subliminal message so when oppression does occur, they cannot view it for what it is – racism or sexism or both. They instead view it as something inherently incompetent about them and not the oppressive structural systems hindering their progress. Being aware of how the interlocking systems operate and black women's roles in those systems would be a transformative learning experience (McIntosh 1995).

Pierce (1995) argues that racism has transformed from the overt, blatant forms of discrimination of the past to the covert, subliminal, racial macroaggression of today. The reality is that regardless of their hard work and accomplishments, these black women will need to negotiate their careers within the barbed world of racism and sexism in a white male-dominated field. Yet, many appear not to know the reality of the glass ceilings of white male-dominated fields, and are definitely not being prepared for it. The authors

believe it is important that these young women, and the generations that follow, are aware of the glass ceilings and institutional oppressions that they will face so that they will have the necessary tools to overcome such obstacles. Denying their intersectional identities could be disempowering, and perhaps the universities preparing them, should recognise such and actively engage in true transformation.

References

- Anzaldúa, G. 1987. *Borderlands: La Frontera*. Volume 3. San Francisco: Aunt Lute.
- Archer, L., J. Dewitt & J. Osborne 2015. Is Science for Us? Black Students' and Parents' Views of Science and Science Careers. *Science Education* 99,2:199 - 237.
<https://doi.org/10.1002/sce.21146>
- Archie, T., M. Kogan & S.L. Laursen 2015. Do Lab Mates Matter? The Relative Importance of Workplace Climate and Work-Life Satisfaction in Women Scientists' Job Satisfaction. *International Journal of Gender, Science and Technology* 7,3:343 - 368.
- Aronson, J. 1995. A Pragmatic View of Thematic Analysis. *The Qualitative Report* 2,1:1 - 5.
- Ayre, M., J. Mills & J. Gill 2013. 'Yes, I do Belong': The Women who Stay in Engineering. *Engineering Studies* 5,3:216 - 232.
- Badat, S. 2010. The Challenges of Transformation in Higher Education and Training Institutions in South Africa. Available at:
<https://www.dbsa.org/EN/About-Us/Publications/Documents/The%20challenges%20of%20transformation%20in%20higher%20education%20and%20training%20institutions%20in%20South%20Africa%20by%20Saleem%20Badat.pdf>.
(Accessed on 25 July 2018.)
- Banchefsky, S., J. Westfall, B. Park & C.M. Judd 2016. But You Don't Look like a Scientist! Women Scientists with Feminine Appearance are Deemed less Likely to be Scientists. *Sex Roles* 75,3-4:95 - 109.
- Blickenstaff, J.C. 2005. Women and Science Careers: Leaky Pipeline or Gender Filter? *Gender and Education* 17,4:369 - 386.
<https://doi.org/10.1080/19378629.2013.855781>
-

- Brand, B.R., G.E. Glasson & A.M. Green 2006. Sociocultural Factors Influencing Students' Learning in Science and Mathematics: An Analysis of the Perspectives of African American Students. *School Science and Mathematics* 106,5:228 - 236.
<https://doi.org/10.1111/j.1949-8594.2006.tb18081.x>
- Braun, V. & V. Clarke 2006. Using Thematic Analysis in Psychology. *Qualitative Research in Psychology* 3,2:77 - 101.
<https://doi.org/10.1191/1478088706qp063oa>
- BusinessTech 2016. *Shocking Pay Difference between Black and White Professionals in South Africa*. 13 July:1 - 4. Available at: <https://businesstech.co.za/news/business/129980/shocking-difference-in-pay-between-black-and-white-professionals-in-sa/>.
(Accessed on 25 July 2018.)
- Cadaret, M.C., P.J. Hartung, L.M. Subich & I.K. Weigold 2017. Stereotype Threat as a Barrier to Women Entering Engineering Careers. *Journal of Vocational Behavior* 99:40 - 51.
<https://doi.org/10.1016/j.jvb.2016.12.002>
- Carlone, H.B. & A. Johnson 2007. Understanding the Science Experiences of Successful Women of Color: Science Identity as an Analytic Lens. *Journal of Research in Science Teaching* 44,8:1187 - 1218.
<https://doi.org/10.1002/tea.20237>
- Charleston, L.J., P.L. George, J.F. Jackson, J. Berhanu & M.H. Amechi 2014. Navigating Underrepresented STEM Spaces: Experiences of Black Women in US Computing Science Higher Education Programs who Actualize Success. *Journal of Diversity in Higher Education* 7,3:166.
- Cho, S., K. Crenshaw & L. McCall 2013. Toward a Field of Intersectionality Studies: Theory, Applications and Praxis. *Signs* 38:785 - 810.
<https://doi.org/10.1086/669608>
- Crenshaw, K. 1994. Mapping the Margins: Intersectionality, Identity Politics and Violence against Women of Color. In Fineman, M.A. & R. Mykitiuk (eds.): *The Public Nature of Private Violence*. New York: Routledge.
- Crenshaw, K.W. 1991. Mapping the Margins: Intersectionality, Identity Politics and Violence against Women of Color. *Stanford Law Review* 43,6:1241 - 1299.
<https://doi.org/10.2307/1229039>
- Creswell, J.W. 2009 *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*. 3rd Edition. California: SAGE.

- Davis, K. 2008. Intersectionality as Buzzword: A Sociology of Science Perspective on What Makes a Feminist Theory Successful. *Feminist Theory* 9:67 - 85.
<https://doi.org/10.1177/1464700108086364>
- Delgado, R. & J. Stefancic (eds.) 2000. *Critical Race Theory: The Cutting Edge*. Philadelphia: Temple University Press.
- De Welde, K. & S. Laursen 2011. The Glass Obstacle Course: Informal and Formal Barriers for Women PhD Students in STEM Fields. *International Journal of Gender, Science and Technology* 3,3: 571 - 595.
- England, K.V. 1994. Getting Personal: Reflexivity, Positionality, and Feminist Research. *The Professional Geographer* 46,1:80 - 89.
<https://doi.org/10.1111/j.0033-0124.1994.00080.x>
- Evans-Winter, V. & J. Esposito 2010. Other's People's Daughters: Critical Race Feminism and Black Girls' Education. *Educational Foundations* 24,1:11 - 14.
- Figuroa, T. & S. Hurtado 2013. *Underrepresented Racial and/ or Ethnic Minority (URM) Graduate Students in STEM Disciplines: A Critical Approach to Understanding Graduate School Experiences and Obstacles to Degree Completion*. University of California, Los Angeles. Available at: <https://heri.ucla.edu/nih/downloads/ASHE2013-URM-Grad-Students-in-STEM.pdf>.
(Accessed on 17 March 2017.)
- Fordham, S. 1993. 'Those Loud Black Girls': (Black) Women, Silence, and Gender 'Passing' in the Academy. *Anthropology & Education Quarterly* 24,1:3 - 32.
<https://doi.org/10.1525/aeq.1993.24.1.05x1736t>
- Gasant, M.W. 2011. *Gender & Perceptions of Science & Science Education: A Case Study in Mitchells Plain*. Unpublished PhD Thesis, University of Western Cape.
- Gasman, M., T.H. Nguyen, C.F. Conrad, T. Lundberg & F. Commodore 2016. Black Male Success in STEM: A Case Study of Morehouse College. *Journal of Diversity in Higher Education* 10,2:181 - 200.
<https://doi.org/10.1037/dhe0000013>
- Gillborn, D. 2015. Intersectionality, Critical Race Theory, and the Primacy of Racism: Race, Class, Gender and Disability in Education. *Qualitative Inquiry* 21,3:277 - 287.
<https://doi.org/10.1177/1077800414557827>
-

- Glass, J.L., S. Sassler, Y. Levitte & K.M. Micheltmore 2013. What's So Special about STEM? A Comparison of Women's Retention in STEM and Professional Occupations. *Social Forces* 92,2:723 - 756.
<https://doi.org/10.1093/sf/sot092>
- Gordon, L. (ed.). 1981. *A Survey of Race Relations in South Africa*. Johannesburg: South Africa Institute of Race Relations.
- Grossman, J.M. & M.V. Porche 2013. Perceived Gender & Racial/ Ethnic Barriers to STEM Success. *Urban Education* 49,6:698 - 727.
<https://doi.org/10.1177/0042085913481364>
- Hammersley, M. 2015. Sampling and Thematic Analysis: A Response to Fugard and Potts. *International Journal of Social Research Methodology* 18,6:1 - 2.
<https://doi.org/10.1080/13645579.2015.1005456>
- Harding, S. 1991. *Whose Science? Whose Knowledge? Thinking from Women's Lives*. New York: Cornell University Press.
- Harrison, D. 1981. *The White Tribe of Africa*. Los Angeles: University California Press.
- Henning, E., W. van Rensburg & B. Smith 2004. *Finding Your Way in Qualitative Research*. Pretoria: Van Schaik Publishers.
- Hill Collins, P. 1990. *Black Feminist Thought: Knowledge, Consciousness and the Politics of Empowerment*. Boston, MA: Unwin Hyman.
- Hill Collins, P. 2000. *Black Feminist Thought*. 2nd Edition. New York: Routledge.
- Hill Collins, P. 2009. *Black Feminist Thought*. 2nd Edition. Reprint. New York: Routledge.
- Hirshfield, L.E. & T.D. Joseph 2012. We Need a Woman, We Need a Black Woman: Gender, Race & Identity Taxation in the Academy. *Gender & Education* 24,2:213 - 227.
<https://doi.org/10.1080/09540253.2011.606208>
- Hunt, J. 2016. Why Do Women Leave Science and Engineering? *ILR Review* 69,1:199 - 226.
<https://doi.org/10.1177/0019793915594597>
- Johnson, A. 2007. Unintended Consequences: How Science Professors Discourage Women of Colour. *Science Education* 91: 805 - 821.
<https://doi.org/10.1002/sce.20208>
- Jordon-Zachery, J.S. 2007. Am I a Black Woman or a Woman Who is Black? A Few Thoughts on the Meaning of Intersectionality. *Politics & Gender*

3,2:245-263.

<https://doi.org/10.1017/S1743923X07000074>

Knapp, G.A. 1999. Fragile Foundations, Strong Traditions, Situated Questioning: Critical Theory in German-Speaking Feminism. In O'Neill, M. (ed.): *Adorno, Culture and Feminism*. London: SAGE.

<https://doi.org/10.4135/9781446217122.n7>

Legewie, J. & T.A. DiPrete 2014. Pathways to Science and Engineering Bachelor's Degrees for Men and Women. *Sociological Science* 18,1:41 - 48.

<https://doi.org/10.15195/v1.a4>

Liccardo, S. 2015. *Re-imagining Scientific Communities in Post-Apartheid South Africa: A Dialectical Narrative of Black Women's Relational Selves and Intersectional Bodies*. Unpublished PhD Thesis, University of the Witwatersrand.

Lorber, J. 1994. *Paradoxes of Gender*. New Haven, CT: Yale University Press.

Ludwig, A. 2006. Differences between Women? Intersecting Voices in a Female Narrative. *European Journal of Women's Studies* 13,3:245 - 258.

<https://doi.org/10.1177/1350506806065755>

Makgoba, M.W. & S. Seepe 2004. Knowledge and Identity: An African Vision of Higher Education Transformation. In Seepe, S. (ed.): *Towards an African Identity of Higher Education*. Pretoria: Vista University and Skotaville Media.

Makunga, N. 2017. Africa Must Bust the Myth that Girls Aren't Good at Maths and Science. *The Conversation* February 19. Available at:

<https://theconversation.com/africa-must-bust-the-myth-that-girls-arent-good-at-maths-and-science-72812>. (Accessed on 20 February 2017.)

McCall, L. 2005. The Complexity of Intersectionality. *Signs* 30,3:1771 - 1800.

<https://doi.org/10.1086/426800>

McGee, E.O., D.T. White, A.T. Jenkins, S. Houston, L.C. Bentley, W.J. Smith & W.H. Robinson 2016. Black Engineering Students' Motivation for PhD Attainment: Passion Plus Purpose. *Journal for Multicultural Education* 10,2:167 - 193.

<https://doi.org/10.1108/JME-01-2016-0007>

McGee, E. 2016. Devalued Black and Latino Racial Identities: A By-product of STEM College Culture? *American Educational Research Journal* 53,6: 1626 - 1662.

<https://doi.org/10.3102/0002831216676572>

- McGowan, B.L., R.T. Palmer, J.L. Wood & D.F. Hibbler Jr, (eds.) 2016. *Black Men in the Academy: Narratives of Resiliency, Achievement, and Success*. Dordrecht: Springer.
<https://doi.org/10.1057/9781137567284>
- McIntosh, P. 1995. White Privilege and Male Privilege: A Personal Accounting of Coming to See Correspondences through Work in Women's Studies. In Anderson, M.A. & P. Hill Collins (eds.): *Race Class and Gender: An Anthology*. Belmont, CA: Wadsworth.
- McPherson, E. 2017. Oh You are Smart: Young, Gifted African-American Women in STEM Majors. *Journal of Women and Minorities in Science and Engineering* 23,1:1 - 14.
<https://doi.org/10.1615/JWomenMinorScienEng.2016013400>
- Mkhize, Z.V. 2011. *Polygyny and Gender: Narratives of Professional Zulu Women in Peri-urban Areas of Contemporary Kwa-Zulu Natal*. Unpublished Masters Dissertation, University of KwaZulu-Natal.
- Noguera, P.A. 2003. The Trouble with Black Boys: The Role and Influence of Environmental and Cultural Factors on the Academic Performance of African American Males. *Urban Education* 38: 431 - 459.
<https://doi.org/10.1177/0042085903038004005>
- Odora Hoppers, C.A. 2005. *Culture, Indigenous Knowledge and Development: The Role of the University*. Johannesburg: Centre for Education Policy Development (CEPD), Occasional Paper 5:1 - 50.
- Ong, M. 2005. Body Projects of Young Women of Colour in Physics: Intersections of Gender, Race and Science. *Social Problems* 53,4:593 - 617.
<https://doi.org/10.1525/sp.2005.52.4.593>
- Pierce, C. 1995. Stress Analogs of Racism and Sexism: Terrorism, Torture and Disaster. In Willie, C., P. Rieker, B. Kramer & B. Brown (eds.): *Mental Health, Racism, and Sexism*. Pittsburgh, PA: University of Pittsburgh Press.
- Republic of South Africa. 1996. *Constitution Act 108 of 1996*. Government Printers.
- Roach, R. 2001. Where are the Black Men on Campus? *Black Issues in Higher Education* 18,6:18 - 21
- Shields, S. 2008. Gender: An Intersectionality Perspective. *Sex Roles* 59,5-6:301 - 311.
<https://doi.org/10.1007/s11199-008-9501-8>
-

- Skeggs, B. 1997. *Formations of Class and Gender: Becoming Respectable*. London: SAGE.
- Smith, S. 2013. Black Feminism and Intersectionality. *International Socialist Review* 91:6 - 24.
- Young, L. 2000. What is Black British Feminism? *Women: A Cultural Review* 11,1-2:45 - 60.
- Williams, J. 2015. Why Just Filling the Pipeline Won't Diversify STEM Fields. *Chronicle of Higher Education* 61,24:1 - 4.
- Wilson, J.A. & N.S. King 2016. Voices of Black Women as Directors of Informal STEM Programs. *Urban Education Research and Policy Annals* 4,1:189 - 200.

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