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FORUM

Against the grain: science education researchers and social justice agendas

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Abstract
This paper is written in response to Alberto J. Rodriguez and Deb Morrison's article entitled, "Expanding and Enacting Transformative Meanings of Equity, Diversity and Social Justice in Science Education." The authors provide a historical account of science education social justice research efforts within the USA and support the need to more critically incorporate social justice research agendas in science education. They summarize four main rationales used in science education research for engaging in equity, diversity and social justice: the economic, moral, demographic shift, and sociotransformative arguments. The authors remind researchers to consider systems of power and privilege when advocating for marginalized people, arguing that social justice should be embodied by the researcher and constantly be enacted within their work. The authors question why few have taken up social justice science education research. This paper expands on these authors' arguments by offering a critical race analysis of the social justice construct in science education research. I conclude with suggesting the need to deconstruct whiteness within social justice science education research agendas.

Keywords Equity · Social justice · Critical research · Education researcher · Science education

This review essay addresses issues raised in Alberto J. Rodriguez and Deb Morrison's paper entitled: *Expanding and enacting transformative meanings of equity, diversity and social justice in science education* (doi: https://doi.org/10.1007/s11422-019-09938-7).

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The road less traveled: social justice in science education

Alberto J. Rodriguez and Deb Morrison's commentary article "Expanding and Enacting Transformative Meanings of Equity, Diversity and Social Justice in Science Education" provides an historical account of science education social justice research efforts within the United States and supports the need to include social justice research agendas in science education. Rodriguez and Morrison advocate for resisting mainstream education research in ways that challenge and disrupt deficit depictions of marginalized students (i.e., Black, Latinx, Indigenous/Native American, some Asian groups, and those living in poverty). The authors critically examine the systemic nature of education that perpetuates the marginalization of these groups of students through policies and practices. Their contribution is practical for guiding research, practice, and policy for persons interested in social justice science education.

Within this paper, I describe Rodriguez and Morrison's presentation of the four most common rationales used within science education to conduct equity research and my responses to each. I found the questions embedded within each rationale to be helpful guides for shaping social justice-oriented science education research. Within each rationale, I have built upon their original propositions, maintaining a race-focused orientation toward social justice concerns.

I do not want there to be ambiguity about how my identities and perspectives on social injustices influence how I write, think about, and speak about topics of oppression in my research. Therefore, I want to be upfront about being a Black, millennial woman who researches the racialized experiences of persons of color within science, technology, engineering, and mathematics (STEM) education. My race, age, and gender impact how I experience STEM education and inform how I advance my social justice research agenda (e.g., Ridgeway and Yerrick 2016).

While Rodriguez and Morrison's article is useful in guiding social justice science education research, I wish to expand on these ideas by adding a discussion of race. Paul T. Le and Cheryl E. Matias (2018) state "[p]lainly, race is only an issue because whiteness exists" (p. 2). Race and racism, therefore, are conduits for White privilege to endure. Accordingly, social justice approaches that do not directly deconstruct, challenge, and decenter whiteness will operationalize colorblindness to perpetuate racial discrimination while leaving whiteness intact.

Social justice as contextual concept

Social justice is a context-dependent concept that focuses on particular, localized situation and power imbalances. In other words, how social justice gets defined and implemented requires a critical consideration of local sociopolitical conditions and relationships. After reading Rodriguez and Morrison's article, I became interested in how a social justice science education researcher not only engages these localized considerations but also how one embodies social justice grounded in particular spaces. To begin to answer this question, consider how Rodriguez and Morrison define social justice:

> Social justice was defined as the conceptual framework guiding the enactment of specific policies and practices to promote diversity and equity. It is important to note that we might be able to observe the presence of diversity and/or equity in any given

> context without the presence of social justice, but it is not possible to have social justice without the presence of diversity and equity. (p. 4)

As their claim indicates, diversity and equity are two elements of social justice. For social justice to be achieved, there has to be a focus on transforming the power structures that promulgate the inequities manifested within any given context. In other words, social justice relies on activism: a person is *doing* something to challenge a social injustice. Therefore, social justice research is the enactment of the researcher's commitment to others for the purpose of challenging systems and practices that have normalized the mistreatment of groups of people.

Problematizing the term social justice

Scholars have noted that the use of the term social justice is an issue (Larnell, Bullock and Jett 2016). Rodriguez and Morrison, drawing on the scholarship of Maria Rivera Maulucci (2012), emphasize that most authors who based their claims on social justice fail to apply the term substantively throughout their articles. They argue that when social justice was not the primary purpose of an author's work but merely worthy of casual mention, it suggests the insignificance of social justice to readers. Even in instances when social justice has been mentioned briefly in scholarly work on the topic, the term has become a cliché, which contributes to the multiple interpretations and uses of social justice as a term. It can both have meaning and be ambiguous at the same time, which causes miscommunication (Whelan, Ridgeway, and Yerrick 2017). The term social justice has been used to be a "catch all" phrase to encompass anything under the banner of "equity," which inadvertently has made it meaningless.

Rodriguez and Morrison describe how social justice and other terms like equity and diversity are used interchangeably for "literary reasons (e.g., to avoid being redundant)" (p. 3), which contributes to the lack of clarity around the term. These literary considerations can also stifle the writing process for social justice science education researchers when they are trying to communicate the specificity of their work. As a result of the ambiguity, the disruptive and activist spirit of social justice used to challenge systems of oppression for marginalized people can be neglected. Therefore, I agree with Rodriguez and Morrison that scholars should clarify the contextual meaning of social justice within their research and be more reflective about how it will be enacted and embodied throughout all aspects of their work. If the meaning of the term social justice does not preserve the spirit of social justice, social justice researchers are then limited in how they can channel their work into equitable science education efforts.

Black scholars and social justice

Prior to academics creating the term social justice, the concept already existed as praxis. Black people in the United States have histories of advocating for social justice: it is at the core of their existence in a society that has privileged whiteness and White people (Martin and Gholson 2012). Consider the scholarship of Black historian Carter G. Woodson (1933), the first person to publish on race and racism in mathematics education. In his work, he described the ways in which Black Americans were being educated from the perspective of Eurocentric worldviews and values that were in conflict with their own, which was damaging. The very nature of Woodson's work was social justice oriented in

that he was interrogating mainstream education in ways that specifically illuminated racial discrimination.

In a different example, sociologist Patricia Hill Collins (2002) recognized Black women's commitment to social justice and centered their perspectives and experiences through her initial theoretical conceptions of Black feminist thought (BFT). Black women believed the feminist movement was co-opted by and for White women, necessitating the birth of BFT (Collins 2002). As a framework, BFT permitted and legitimized the use of alternative texts that prioritized voices previously excluded from the academy. Many social justice-oriented frameworks were born from the inclusion of diverse perspectives which often come from people in marginalized populations. Both Woodson and Collins challenged canonical texts that excluded the voices and experiences of the Black community and Black women, respectively. Their scholarly contributions have inspired and mobilized the scholarship of others who are dedicated to making their life's work exemplars of social justice (e.g., Gholson and Martin 2014). Historically, Black people have been instrumental in unpacking systems of oppression; it is imperative then to include their perceptions in equitable science education.

The rationales for social justice science education research

In this section, I will present Rodriguez and Morrison's four main rationales for how equity research has been couched in science education by both mainstream and non-mainstream education researchers. Additionally, I will provide my own expansion on these rationales by incorporating the work of other equity-focused scholars with an emphasis on deconstructing whiteness and explaining the experiences of Black students.

Rationale 1: the "impending doom and gloom" or economic superiority argument

The capitalist-based reasoning to focus on equity in STEM casts the illusion that STEM education efforts will bail the US out economically. This directs focus to funding STEM education and designing various efforts and initiatives with the hopes of boosting STEM interest and performance in US schools (Rodriguez 2015). While these initiatives present themselves as promising, thoughtful and critical consideration for historically and contemporarily marginalized people is not employed; therefore, these efforts will fall flat for engaging all students (Rodriguez 2015). Echoing the Rodriguez and Morrison's concern, Erica Bullock (2017) asserts the need to specify how policy efforts are designed and who they target. In her study on the Memphis, Tennessee school district, Bullock focused on a policy created to ensure that all students have access to high-quality STEM instruction. However, upon a closer examination, the district's STEM resources were preserved for White students. This is particularly notable given that the district is predominantly Black. Therefore, one wonders how this happens, and how STEM educational policy creates access for White students in a majority Black city? This major oversight is possible because of the racialized script (Gholson and Wilkes 2017) and testing mechanisms (i.e., selective, test-based admission) established to ensure exclusion of those students residing in the predominantly Black surrounding community (Nelson 2017). The access to and the benefits of STEM education is reserved for White students for their economic success (Bullock 2017).

Rationale 2: the moral argument

This argument suggests that equity and diversity work is the "right thing" to do. We need to move away from the rhetoric of equitable education as a charitable act and reframe it as a means of reparations for historically disenfranchised people. Rodriguez and Morrison, drawing on Gloria Ladson-Billings (2006), call researchers to abandon the Good Samaritan approach to equity research. The authors' describe an "educational debt owed to all those groups of individuals who have been historically marginalized, and thus prevented from fully accessing their aforementioned unalienable rights of life, liberty, and the pursuit of happiness" (p. 7). Determining how education research can act as educational reparations to students should be the motivation behind diversity and equity research. I would add Tate's (2001) declaration that inequities in science education, at the core, are a civil rights issue, which would challenge education researchers to critically reflect on exactly how their research will impact marginalized communities. However, the US has traditionally not responded well to the idea of reparations, including educational ones. This would require the relinquishing of power structures that are in place (Nelson 2016) and acknowledging a long history of traumatizing and oppressing Black (Dumas 2014) and other marginalized people (Brayboy 2013).

Rationale 3: the demographic shift argument

Rodriguez and Morrison point out that scholars who use this argument to motivate science education research are just recasting the economic superiority argument (Rationale 1). It places minoritized students in the spotlight to aid the US with its attempts to remain a global competitor. Currently, the discussion around how to incorporate the growing population of Latinx in US schools centers on how these groups can be exploited for the purpose of maintaining US global standing within STEM. Notwithstanding, these groups have been traditionally excluded from fully participating in STEM (McGee 2016), resulting in little change in funding and professional development to better support these students (Rodriguez 2015). Typically, in US schools, students and teachers from marginalized populations are expected to conform to White mainstream science (Mensah and Jackson 2018). This is worrisome since people from these groups receive the message that science education is a place where their culture, knowledge, and problem-solving approaches are devalued (Mutegi 2011).

However, while people have made efforts to construct more inclusive science education environments, the homogenizing of entire groups of students like Latinx does not allow for the particularities of the communities and unique histories within the US to be acknowledged (Johnston-Guerrero 2016). Marc Johnston-Guerrero asserted that dismissing more nuanced conversations around Latinx communities as "messy" stems from the comfortability of whiteness and post-racial ideologies. Johnston-Guerrero described how the term Latinx needs to be unpacked, and, more importantly, how the particularities that result from that process can inform policies that seek to respond to the unique needs of groups.

Rationale 4: the sociotranformative argument

Rodriguez and Morrison favor this argument over the others. It focuses on the researcher being committed to change. It calls on researchers to investigate the multifaceted ways

in which their work can produce positive change in their educational context. Furthermore, it encourages researchers to consider their adjacent role as faculty members and how they can leverage their research and positions within institutions to foster change. However, I would argue that it is not always straightforward to identify who is a social justice ally within the academy. For example, in the study conducted by Lori Patton and Stephanie Bondi (2015), they investigated White men faculty members in a predominately White institution that others perceived to be social justice allies. Patton and Bondi defined social justice allies as:

> [P]eople who work for social justice from positions of dominance, such as heterosexuals working toward social justice in support of gay, lesbian and bisexual people or Christians involved with Muslim students working to secure spaces across campus for daily prayers (p. 489).

In this work, Patton and Bondi found that many of these White social justice allies did not proactively disrupt the status quo and, in fact, often benefited from the preservation of power structures. My contribution to this argument is a direct call for science education researchers to leverage their positionality within the academy to disrupt policies and pedagogies of exclusion at all levels in whatever ways they can. The degree with which students of color are more likely to be denied equitable preparation and access within K-12 spaces cannot be overstated, which leads to their underrepresentation in higher education (Ridgeway and McGee 2018). When students are denied access to quality science and mathematics preparation, their opportunities to fully participate in science-based majors are reduced, causing their critical voices and brilliant minds to be marginalized out of science-based majors (Mensah and Jackson 2018).

Consonant with a sociotransformative rationale, students of color have been found to be social justice oriented (McGee and Bentley 2017), historically having led mass movements on college campuses (Reynolds and Mayweather 2017). The beauty of these movements is that students are able to connect the societal issues within their communities, college campuses, and disciplines to advocate boldly for social change. Considering the passion to address societal issues within these groups of students brings to the forefront the importance of interconnecting science and equity-based work (McGee and Bentley 2017).

Positioning the science education researcher within communities

The question becomes where the researcher, educator, and/or policy maker are positioned with respect to marginalized communities. As people who occupy positions in institutions that have historically excluded marginalized groups, researchers then need to think critically about how to leverage their work to construct more just communities around them.

Science education researchers do not have to travel far to find oppressed individuals as society has crafted it so that researchers are in close proximity but rarely share space with them. It becomes essential for researchers who are social justice oriented to find ways to engage with marginalized communities that, due to their social positions, would not otherwise access quality science education. Research should be treated as a tool that can support others, and researchers should develop an awareness about how research can inform solutions for local issues and real people. Just as Rochelle Gutiérrez (2013) has argued that math needs people inasmuch as people need math, the same should be said for science. Not

only does working science into the community help the community, localized community knowledge (Gutstein 2016) can help inform science.

Not only is it imperative for researchers to consider their positionality to aid social justice, educators who are not aware of local contextual factors cannot be as effective and may reinforce systems that disenfranchise marginalized groups. Gutiérrez (2017) described how educators need to learn how to "negotiate their local politics" (p. 12). I agree with Rodriguez and Morrison's suggestion that educators need to be "deeply rooted in the communities in which they teach" or else they will not be responsive to the unique needs within their communities. Social justice science education researchers who are not informed on political matters can be limited in their understandings of the complexities of social injustices surrounding them. It can cause people to unwittingly advocate for policies and practices that backfire and have a negative impact on marginalized communities (Nelson and Grace 2015).

Safety in numbers: the need to develop scholarly communities

I am responding to Rodriguez and Morrison's query about why there has been so little change for marginalized students' educational opportunities. There are critical and equity-focused researchers on the frontlines working toward equity but they are being countered and outnumbered by mainstream education researchers (Ridgeway and McGee 2018). I share below a personal anecdote describing my own search and connection to scholarship that affirmed my purpose and place within the academy.

I recall being impacted by the scholarship of Leon Walls' as a doctoral student in a program that had extremely low representation of students of color. Leon Walls, a Black science education researcher, is interested in "equity and social justice for all students, including Black and other K-12 students of color" (Walls 2017, p. 494). He has described himself as carrying a "unique perspective, set of lived experiences, and understanding of the world around me…" (Walls 2017, p. 494). It is from this positioning that I was mentored through Walls (2017) article "Awakening a Dialogue: A Critical Race Theory Analysis of US Nature of Science Research from 1967 to 2013," published in the *Journal of Research in Science Teaching,* a science education journal. While I recognize that a mainstream journal can limit the voice and perspective of social justice research, I felt encouraged when I read his article because Walls challenged science education researchers by closely examining their practices at a time when I was still developing a science education research identity. Walls' work allowed me to affirm my strong desire to engage in community-based work, while challenging mainstream practices that marginalized people: the people about whom I care about most.

Walls' article, in my opinion, was a critical contribution to the field. It examined the nature of science and how race and racism operate. Walls discussed how White students were used as the norm to measure all students. The centering and valuing of White students is an act of oppression against non-White students. Today, on Google Scholar, this paper has 23 citations. I understand the publication process can lag in education journals and that there could possibly be a latent effect. Despite this fact, I questioned whether the readers were not influenced by Walls' contribution or if they disregarded his sentiments since it challenged previously held beliefs, such as White superiority. Given that this article was so formative to myself as a science education researcher, I was able to see how Walls

used CRT on the nature of science to draw out whiteness in operation and how non-White students were devalued.

Social justice science education research and the need to consider whiteness

Danny Martin (2013) has suggested that mathematics education is a racial project and whiteness operates to maintain the racialized hierarchy that places Black, Latinx, and Indigenous/Native Americans at the bottom. Mensah and Jackson (2018) pressed that whiteness has operated to privilege White people to maintain ownership over science and determines who gets to participate and how they get to participate. There needs to be a critical interrogation of whiteness within science education. Le and Matias (2018) asserted that "Understanding whiteness is paramount to facilitating the validation of our Students of Color and their lived experiences in science education" (p. 6).

Using the construct of whiteness and students' racialized experiences, I would like to add to the authors' argument and suggest that the deconstruction of whiteness and how it operates within science education through teacher preparation (Mensah and Jackson 2018); science content (Mutegi 2011), and who is considered a scientist (Le and Matias 2018) need deeper consideration. Science education is imbued with whiteness; it is the mechanism that marginalizes groups. Whiteness encourages racist ideologies and practices to be upheld and imposed on groups.

Mathematics education researchers Dan Battey and Luis Leyva (2016) describe how "The lack of attention to whiteness leaves it invisible and neutral in documenting mathematics as a racialized space" (p. 49). Similarly, we might consider how whiteness operates within science education spaces. In order to maintain critical conversations within science education, attention should focus on how to disrupt power dynamics and privilege which operate to perpetuate inequities.

Social justice science education research as praxis

I stand in solidarity with Rodriguez and Morrison. In "Expanding and Enacting Transformative Meanings of Equity, Diversity and Social Justice in Science Education." They problematize the use of the term "social justice" and call others to join in their efforts to engage in socially transformative social justice science education research. They raise awareness of institutional and individual challenges that can present barriers for social justice science education researchers and offer some suggestions to counter them. Adding to this call, I emphasize that science education researchers would be remiss to neglect deconstructing whiteness as critical to creating equitable science education.

Rodriguez and Morrison outlined the four main rationales often used by researchers to engage in equity research and the need for transformational approaches for equitable science education environments. The heart of the paper was to advocate for marginalized science students by urging researchers interested in social justice to be more consistent and critically aware of whether their social justice goals are really enacted throughout their studies. The authors raised the question about why there has been very little change, given the decades of research which advocates for equitable science environments. One explanation I provided was the critical mass of mainstream education

researchers that outnumber equity-focused scholars. Equity scholars are a numerical minority, making it that much more difficult to bring their voices and concerns to the forefront of this field.

In addition, I argued that researchers interested in social justice approaches need to understand whiteness and how it operates in order to avoid taking its influence for granted. It would be fundamentally flawed to engage in equity research with Black students if the researcher had deficit views of them and could not recognize the diverse ways in which Black students display their brilliance (Leonard and Martin 2013). Research has a complicated history of being a mechanism to rationalize the oppression of marginalized people (Smith 2013). Therefore, social justice science education researchers should have a strong commitment to utilizing the most equitable research approaches possible to address the power imbalance between researcher and participants (Rodriguez 1998).

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