

On negotiating White science: a call for cultural relevance and critical reflexivity

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Abstract:

This article is a response to Randy Yerrick and Joseph Johnson’s article “Negotiating White Science in Rural Black America: A Case for Navigating the Landscape of Teacher Knowledge Domains”. They write about research conducted by Yerrick in which videos of his teaching practice as a White educator in a predominately Black rural classroom were examined. Their analysis is framed through Shulman’s (1986) work on “domains of teacher knowledge” and Ladson-Billings’ (1999) critical race theory (CRT). Although we appreciate a framework that attends to issues of power, such as CRT, we see a heavier emphasis on Shulman’s work in their analysis. We argue that a culturally relevant pedagogy (CRP) framework has the potential to provide a more nuanced analysis of what occurred in Yerrick’s classroom from a critical lens. Thus we examine Yerrick and Johnson’s work through the five main CRP components (as defined by Brown-Jeffy and Cooper 2011) and ultimately argue that science educators who want to promote equity in their classrooms should engage in continuous critical reflexivity, aid students in claiming voice, and encourage students to become not only producers of scientific knowledge but also users and critics of such knowledge.

Keywords: Critical race theory | Culturally relevant pedagogy | Critical multicultural education | Intersectionality Equity

Article:

This article is a response to “Negotiating White Science in Rural Black America: A Case for Navigating the Landscape of Teacher Knowledge Domains,” in which the authors, Randy Yerrick and Joseph Johnson, explore “the nature of requisite teacher knowledge for teaching lower-track science students” through an autoethnographic study in which they examined video accounts of Yerrick’s teaching practice searching for “documented missteps, dead-ends, and unfruitful trajectories informed by the teacher’s incoming knowledge” which were compared to

“necessary modifications”. Yerrick and Johnson argue that the results of their study show that “teachers of majority backgrounds can learn to teach diverse students with at least moderate success”, and they discuss implications for research and teacher education. Their work is framed through an examination of “domains of teacher knowledge” as described by Lee Shulman (1987) and critical race theory (Ladson-Billings 1999).

We agree with Yerrick and Johnson that this kind of work—research that examines how White teachers might successfully work with marginalized students of color in science—is needed, and we appreciate the opportunity they provide by sparking the conversation. Their work prompted many hard questions and rich conversations among us. For example, we wondered what the analysis and findings might have uncovered if the theoretical framework had been different and if the critical race theory lens had been more prominent. Given that Yerrick and Johnson appear to be most interested in deconstructing what contributed to the positive aspects of Yerrick’s work as a White science teacher with students of color, in this paper we decided to broaden the theoretical framework to incorporate one of culturally relevant pedagogy (Ladson-Billings 1995) that infuses a critical race theory lens.

Yerrick and Johnson used Shulman’s (2004) “unaltered theoretical framework to begin [their] coding of teacher knowledge [and] identify knowledge domains tapped by [the teacher] during planning, instruction, and reflection”. We see this framework employed in the findings discussion. They additionally state that “Ladson-Billings’ Critical Race Theory (1999) was important for interpreting when and how both successes and failures in teaching occurred”, yet we see little discussion of how a CRT framework is employed. Although Yerrick and Johnson highlight in the “Teacher knowledge and preparedness” section several of the key tenets of CRT: (1) race is central to understanding inequity, (2) racism is a common experience, (3) the legitimacy of counter storytelling, (4) interest convergence, and (5) critique of liberalism (Delgado and Stefancic 2001), the assertions in their findings have remote connections to these tenets. For example, Yerrick and Johnson state “Ladson-Billings’ notions of CRT were brought into sharp focus as we asked students who their teachers were and how they felt teachers treated them in other classes”, yet they provide no clear descriptions of what aspects of CRT were brought to bear on the findings and analysis. As a result, the majority of the findings are analyzed in terms of Shulman’s framework—the teachers’ subject matter knowledge, curricular knowledge, and pedagogical content knowledge with some attention to the “student milieu”. Discussions of power structures are minimized; such discussions could include: (1) a deeper, more thorough personal examination of the teacher’s identity work and how it impacts content delivery; (2) a truthful exploration of whose knowledge is really being shared and the origin of that knowledge; and (3) the recognition that issues of power, as represented by the teacher, are present in the classroom (Delpit 1995).

Culturally relevant pedagogy: A new framework and unanswered questions

As scholars concerned about issues of race, class, and gender inequity who are invested in promoting equity and social justice in the classroom, we want and appreciate a critical framework that attends to issues of power, such as CRT. However, we also feel that the critical multicultural education literature might provide a useful framework for analyzing what occurred in Yerrick's classroom. A significant amount of multicultural education literature examines how teachers might effectively work with students who have cultural backgrounds distinct from their own, including but not limited to how White teachers might work with students of color. For example, Christine Bennett (2010) provides a comprehensive multicultural education text with information about teaching concepts and strategies needed to create positive classroom climates for all children; the book also includes a variety of lesson plans. James Banks (2000) implores in-service and preservice teachers to consider the various cultural identities of their diverse students as well as their own ethnic and cultural biases and offers a plethora of strategies for teaching in a more multicultural manner. Gary Howard (2006) describes culturally relevant teaching strategies in light of the increasing student diversity in schools that incorporate socially just and transformative pedagogy. The aforementioned are just a few of the many available writings that provide guidance to teachers on how to be critical multicultural educators. To narrow our analysis, we use the framework of culturally relevant pedagogy (CRP), as defined by Shelly Brown-Jeffy and Jewell Cooper (2011). In fact, in places it appears that Yerrick and Johnson are using, at times, a CRP framework more than a CRT lens. For example, they argue that they find

particularly useful Gloria Ladson-Billings' (1999) notion of Critical Race Theory (CRT) as it challenges authors and teachers of all backgrounds to consider carefully what cultural practices they bring to bear on learning contexts and how these practices may come into conflict with existing practices.

Here, they in fact draw upon principles that align with culturally relevant pedagogy. We see, in particular a direct connection to Luis Moll's conception of students' funds of knowledge (Moll 1992).

We choose Brown-Jeffy and Cooper's interpretation because they draw upon a vast amount of pertinent literature and conceptualize their theoretical model through a critical race theory lens. Brown-Jeffy and Cooper identify five themes in their CRP framework: (1) identity and achievement, (2) equity and excellence, (3) developmental appropriateness, (4) teaching the whole child, and (5) student-teacher relationships. We unpack each of these themes below in relation to Yerrick's work.

Identity and achievement

Within identity and achievement, Brown-Jeffy and Cooper (2011) explain that teachers should be critically self-reflective about who they are and how that might bias how they view their students. In addition, culturally relevant teachers "acknowledge that the system is racist" (p. 73),

identify various cultures within the classroom, publicly acknowledge students' cultures, and not only view but also affirm diversity as an asset.

Given Yerrick and Johnson's use of the CRT frame, it is clear that they acknowledge that the system is racist; in fact they state that as "white male" science educators they must determine how to make change in public schools "for students who have been marginalized by hegemonic practices". They explicitly state that Yerrick is a White teacher going into a classroom with 80% Black students. While this recognition of racial differences is a good first step, through a CRP frame, we are left wondering several questions such as: What was the racial makeup of the rest of the class and how did the teacher attend to their needs? What were some of the distinctions in the cultures of the various Black students? How did socioeconomic status factor into the equation of culture and students' learning experiences? What was the demographic breakdown in terms of gender, and more importantly, how might gender have impacted the experiences of teaching and learning particularly in relationship to how and where they grew up? After all, what it means to be a girl in the Deep South might be different, in some ways, than what it means to be a girl in the Far West.

Critical reflexivity requires teachers to actively reflect on how students are positioned in various ways by the school system and how teachers themselves might be positioning students in ways that inhibit or enhance growth and understanding. Yerrick and Johnson demonstrate a degree of such critical reflexivity in statements such as this one by Yerrick, "Having rarely experienced racial bias as a White male it was essential to figure out how to carry on discussions regarding race and relations when I represented some oppressive authorities". Although this is a nascent enactment of critical reflexivity in relation to privilege and oppression, it is focused predominately on race; a more nuanced reflection would examine the multidimensionality of identities. Often identity positionings are either one-dimensional or multiple identities are conflated; Black, for example, often becomes unquestionably equated with "diverse," "poor/working class," and "lower-tracked", when none of these identities are necessarily linked. In the article, for example, we see only a surface examination of gender related to the teacher and how gender might impact student learning. For example, Yerrick discusses the added burden for females trying to be successful in school while juggling pregnancy and children. Upon learning of his female students' specific positionalities, he acknowledges that science might not take top priority; this provides him a greater understanding of their predicament. However, he eliminates a gender and class-focused analysis as to what this might mean for both the students and his teaching practice. Within the culturally relevant pedagogy framework, teachers are called upon to reflect upon students' cultures and the ways privilege, oppression, and power influence learning outcomes and opportunities. Thus, it is important to recognize the intersectionality of identities related to race, class, and gender and how social positionality impacts students' cultural ways of being and learning experiences. Yerrick argues that he learned how "to best meet the needs of students who were so different from [himself]". By employing critical reflection with a

CRP frame, Yerrick may have further unpacked those differences and the related implications for teaching and learning.

Equity and excellence

Equity and the promotion of excellence require that teachers provide students what they need and incorporate “multicultural content in curriculum and instruction” (Brown-Jeffy and Cooper 2011, p. 74). Brown-Jeffy and Cooper remind readers that “the acknowledgement of racial, ethnic, or cultural difference should not be reduced to simplistic, symbolic, and meaningless tasks” (p. 75) but should always also include high expectations for both students and teachers. Furthermore, race must be acknowledged as a significant factor in equity; to recognize race teachers can encourage students to employ counter storytelling, stories told by people about their experiences as part of the non-dominant culture as a critique of “the mainstream master narrative” (p. 75).

Yerrick’s data collection allowed for some counter storytelling. For example, Yerrick notes that in a focus group,

All the students reported White teachers throughout their day assigned little value to students’ knowledge and their self assessment was that very little content was retained. White teachers at their school operated as if access to facts and instructions was equivalent to learning science, English, math, social studies, and other subjects.

Yerrick counters this simplistic low expectation of science learning by guiding students into “making arguments and gathering evidence which [he] thought was more representative of the discourse of scientists”. While this does heighten the low expectations that these students have experienced elsewhere, it is unclear how multicultural content is being incorporated into the curriculum or how mainstream narratives are being critiqued. Yerrick states that he “could better teach [his] students through their personal experiences and justification of their common sense thinking”. He provides an example of how he incorporated culturally relevant pedagogy by revamping traditional assessment tasks such as multiple choice tests, replacing them with formative assessments in which they were encouraged to “use a familiar voice in a familiar setting”. Through this emphasis on pedagogy, traditional science content and science as a master narrative remains unchallenged, thus eliminating the possibility for true counter storytelling. Given that specific examples of this were not provided, we wondered how the diverse cultures and backgrounds of these students informed the ways in which Yerrick chose to enact his expectations in students’ argumentation and evidence gathering.

Yerrick and Johnson emphasize the importance of students appropriating scientific discourse. In relation to the theme of equity and excellence, we raise this question: Given the vast sociocultural realities of these particular students, what applications of this newly developed discourse extend beyond the classroom to their lived realities? In a critical school science—an approach to teaching science that promotes equity—students are viewed as producers, users, and critics of scientific knowledge (Calabrese Barton and Osborne 2001). In a school science with

critical aims, the next step, after teaching students to become fluent with “scientific syntactic structures” (Schwab 1961, cited in Yerrick and Johnson), would be to leverage these tools in service of challenging the status quo in their own lives and communities. Brown-Jeffy and Cooper explain that “multiculturalism in the curriculum can turn racism on its head and use race as the springboard for equality” (p. 75). This would require taking the promoted syntactic structures and using them as a tool towards a greater goal of transforming the marginalized positions these students face.

Furthermore, knowing the importance of promoting multicultural content to engender equity (Brown-Jeffy and Cooper 2011), we ask how the students’ cultural capital became part of the scientific dialogue and the pedagogical choices made for learning that dialogue. Yerrick recognizes this aspect of multicultural science education, stating,

I was open to the students’ stories and did not challenge or refute them. Rather I treated myself as an outsider and tried to piece together a puzzle of what I was being told. As the students recognized this, they allowed me more and more access into their world. I was open to the new knowledge of students’ lives, who they were, where they came from, how they had learned to learn and allowed my own thinking to shift based on this new knowledge.

Are there more concrete examples of students’ home lives, outside interests and cultural capital? What specific ways did he leverage these in service of science learning? What ways did this knowledge shift Yerrick’s thinking? Addressing these questions would help us understand exactly how equity and excellence were promoted, perhaps providing a model for other science educators with similar equity aims.

Developmental appropriateness

Developmental appropriateness takes into consideration “the cognitive, emotional, social, and psychological needs” in a way that “generates teaching styles that incorporate the vast differences in culturally-based learning styles and learning preferences of students” (Brown-Jeffy and Cooper 2011, p. 76). Critical race theorists argue that teachers must acknowledge that students of color who have experienced racism in school may not trust that the educational system will assist them. “Good pedagogy is more than just teaching the content information; what is important is to teach students so that they are able to learn and to transfer such learning in various environments” (Brown-Jeffy and Cooper 2011, p. 76).

Brown-Jeffy and Cooper’s (2011) argument begs the question of what counts as science and how that science “acknowledges, explores, and utilizes” the “knowledge that students bring with them to school” (p. 75). From a CRP perspective, Brown-Jeffy and Cooper state that “developmental appropriateness also means that teachers are cognizant of the dominant and sometimes racist, non-inclusive ideology” (p. 76) that permeates pedagogical choices. From this standpoint, the syntactic structures of science can also be critically examined for their exclusivity and for their

reliance on dominant discourses. In their paper, Yerrick and Johnson raise the historically problematic nature of “predominantly White, male contexts” of scientific knowledge production. These issues of race could be as prominent in his study as they are in his title: “Negotiating White Science in Rural Black America”. Is there a place in their argument to critique the overly narrow and historically problematic (racist) nature of scientific knowledge and discourse norms? “Epistemological underpinnings of how we know things scientifically”, as Yerrick and Johnson state themselves “have not originated in a vacuum”. A critical examination forces us to question the singular upholding of these narrow standards as the only model of scientific discourse. Does this narrow view of *what counts* as scientific include the specific discursive, cognitive, emotional, social, and psychological needs of each of Yerrick’s students?

Teaching the whole child

Culturally relevant teachers should also teach to the whole child in ways that acknowledge students’ individuality while also acknowledging cultural group behaviors. This means that “it is crucial for teachers to learn about all of their students, especially those who are culturally different from the teachers themselves” (Brown-Jeffy and Cooper 2011, p. 77). Teachers must recognize that children enter school with “funds of knowledge” (Moll 1992) they develop in their home culture. Effective teachers can build upon students’ cultural knowledge to scaffold their learning.

Yerrick mentions a similar point: “This study suggests that the domains encompassing directly students’ milieu, expanding pedagogical practices to incorporate students’ knowledge, and the nature of the disciplinary structures led to the increased instances of success”. Yerrick mentions that he shifted his teaching strategies to “better meet the needs of students”. This is a laudable starting point for what makes for an effective multicultural science educator. Beyond this, we would argue that just knowing the students is not enough to affect critical change in the science classroom. Angela Calabrese Barton and Margery Osborne (2001) state that critical school science “has an ethical responsibility for the knowledge it produces about the world” (p. 22). As such, knowing students’ knowledge, in and of itself, is less powerful without knowing to what ends it serves. We argue that teaching to the whole child means using funds of knowledge in ways that encourage students’ agency and self-empowerment. Without a philosophical, dispositional bent towards a desire to critically change the structures of power and oppression that these students must endure, knowing these students’ funds of knowledge will not, by itself, lead to transformation of the status quo.

Student–teacher relationships

The last theme developed in the CRP framework is that of student–teacher relationships. Central to this theme is the concept of caring which can be demonstrated by teachers to students through respect, patience, facilitating learning, connectedness, and acceptance of “different discourse patterns and styles of verbal and nonverbal communication” (Brown-Jeffy and Cooper 2011, p.

78). Teachers should also “encourage connectedness *between* students” (Brown-Jeffy and Cooper 2011, p. 78). Culturally relevant teachers likewise recognize the importance of working with students’ parents and community to enhance student–teacher relationships.

Yerrick and Johnson specifically address different discourse patterns; they state, “students’ discourse norms may be quite disparate from those teachers bring to the classroom”. Yerrick explains that his attempts to engage students resulted in student responses of “short, superficial answers to satiate the teacher until the teacher could provide the ‘real answer’”. To remedy this, Yerrick emphasized, “the *how we know* questions (syntactic structures)” to better incorporate students’ experiences and thinking. The examples Yerrick shares demonstrate greater engagement and some scientific reasoning. At the end of that section titled “Structures of scientific knowledge guiding my teaching,” Yerrick states,

I was not familiar with students’ cultural beliefs and ways they would disagree or challenge one another in social settings. In turn my students were unfamiliar with the structures and norms of scientific discourse outside of received knowledge. Science had typically been all about facts and one either knew them or they didn’t. It was through my wrong turns in my teaching that I learned that students *did* actually want to contribute and I learned the topics and means to scaffold their contributions into constructive arguments.

Thus, he achieved his teaching goal, based on his framework, of beginning to help students learn his “scientific discourse”. However, through a CRP framework, he might have also addressed what he did or didn’t do to learn about his students’ cultural beliefs and experiences. As readers, we are left wondering what he learned about his students beyond their desire to contribute; we also question how the students’ discourse norms were incorporated. It is clear that the students are increasing talk time; Yerrick provides examples where students shift from one-word answers to lengthier, more engaged responses. However, we are not provided evidence that students are claiming voice. We see a distinction between *claiming space* and *claiming voice*. Yerrick provides evidence that students are claiming space—saying more—but the examples of what they share are still heavily directed by the teacher and his goals versus being directed by the students. Talking more, claiming space, does not necessarily mean that students are claiming voice. It would have been helpful to have more examples of students claiming voice with particulars about what they said; we wonder if examples of this existed in the data.

Critical reflexivity, claiming voice, and critical school science

We reiterate the urgency of this type of research that examines the negotiation between White science educators and students from non-dominant groups. Yerrick and Johnson bring to the fore the importance of this work, as evident immediately in their bold title. Highlighting their desire to deconstruct this work, particularly how White educators might work with students who are not part of the dominant culture, we invoked a culturally relevant pedagogical framework to unpack what occurred and what else might have been done to promote equity in the science classroom.

We find a strong desire by Yerrick and Johnson to promote engaged learning, particularly of scientific discourse. As we developed our analysis of their work through the five principles of culturally relevant pedagogy (Brown-Jeffy and Cooper 2011) we found strengths and weaknesses of his work in the classroom and his analysis of the data. There are three main ideas we discussed above that we wish to highlight.

First, we believe that it is important for all educators to engage in critical reflexivity that explores how intersectionality of identities might impact the teaching and learning process. Doing such critically reflective work would allow teachers to examine the complexities of how individual identities intersect with larger cultural ways of being. This would assist educators in recognizing various cultural repertoires of practice (Gutierrez and Rogoff 2003) without essentializing students who belong to groups such as “rural Black America”.

Second, we highlight the distinction between claiming *space* and claiming *voice*. It is important for students to claim space (i.e. increase talk time) in the classroom. However, culturally relevant critical practice would necessitate that students also claim *voice* in ways that increase their agency, make knowledge they produce relevant for their lives and future learning, and critique knowledge for its problematic histories. Thus, White teachers must be cognizant of what students share and should continually strive to empower students to claim voice.

Third, Yerrick explains his evolving pedagogical strategies, with one end goal of students appropriating scientific discourse so students may better engage in science practices. This goal, aligned with what Calabrese Barton and Osborne (2001) call “progressive school science” which positions students as producers of scientific knowledge. A “critical school science”, however, positions students as producers, users, and critics of scientific knowledge (Calabrese Barton and Osborne 2001). In this view, learning science is not just an academic task; “it is about interacting with/in the world” (Calabrese Barton and Osborne 2001, p. 21). Critical school science, in addition, recognizes the culturally-based nature of scientific knowledge. We argue that adopting a critical school science lens could assist White educators in promoting equity by: reconstructing the end goals of science education toward transformative ends and questioning what counts as legitimate scientific thinking and knowledge in ways that broaden who gets counted as “being scientific”. Taking a more critical school science lens also works to enable students from non-dominant cultures to deal with “societal problems/real life and the needs of the local community” (Calabrese-Barton and Osborne 2001, p. 22) in ways that can combat the oppressive status quo these students face on a daily basis.

We agree with Yerrick and Johnson that White science teachers have the capacity to teach students of color, including rural Black students, with some success. Doing so, we argue, requires conscious commitment and vigilant practice. Such practice, we believe, might best be aided with goals that align with culturally relevant pedagogy and require a critically reflexive practice that takes into consideration how power politics related to intersectionality of identities might impact the teaching and learning process for both teachers and students. However, taking a

more critical school science lens will require more work on the part of educators. Therefore, the question then becomes, “Do we have the *will* to educate all children” (Hilliard 1991)?

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