Science
Education

ISSUES AND TRENDS

And Still I See No Changes: Enduring Views of Students of Color in Science and Mathematics Education Policy Reports

VINCENT BASILE, ENRIQUE LOPEZ
School of Education, University of Colorado at Boulder, Boulder, CO 80309, USA

Received 21 December 2013; accepted 22 December 2014
DOI 10.1002/sce.21156
Published online 15 April 2015 in Wiley Online Library (wileyonlinelibrary.com).

ABSTRACT: Federal education policy reports in science and mathematics education have treated Students of Color consistently over the past two decades, addressing the underrepresentation of minorities in science, technology, engineering, and mathematics (STEM) fields with little regard to actual issues of race and ethnicity. We examine how 17 federal education policy briefs focusing on STEM have addressed issues of equity with regard to Students of Color. We use a critical race theory lens to interpret and understand our findings. We find that the documents used broadly defined, racially essentializing terms; that discourse surrounding race fluctuated, perhaps cyclically, over time; and that arguments for inclusive STEM education were made predominantly from a one-sided economic perspective, favoring the owners and operators of STEM enterprises. *Sci Ed* **99:**519–548, 2015

This is business, no faces, just lines and statistics . . . it's all mathematics

Yasiin Bey

INTRODUCTION

In 2010, the President's Council of Advisors on Science and Technology (PCAST) released a report on science, technology, engineering, and mathematics (STEM) education,

Correspondence to: Vincent Basile; e-mail: vincent.basile@colorado.edu

Prepare and Inspire: K–12 Science, Technology, Engineering, and Math (STEM) Education for America's Future. Since its release, this report has become a prominent document within STEM education. The PCAST called for increased numbers of Students of Color to pursue STEM careers. The report offered several reasons for the call, two of which—the potential for economic gain and the benefit of diverse perspectives for those who own, control, and profit from scientific and mathematical enterprises—are common in many other STEM policy reports preceding the release of the PCAST report. Beyond these historically common reasons, the PCAST report added that STEM access can financially benefit Students of Color who, along with all children, deserve to experience the excitement of STEM. This is a recognition of the humanity of our Brothers and Sisters of Color, seeing their faces, not just the lines and statistics, a call that harkens back to the notions expressed over a century ago by Du Bois (1903) and later by the Civil Rights Movement of the 1960s.

Science and mathematics education in their modern forms came to the political forefront as a response to military threat. The United States turned to math and science to combat the threat initiated by the Soviet Union launching into orbit a ballistic-missile casing known as Sputnik, and math and science have since been treated essentially as an asset resource monitored and protected by the federal government (Lappan & Wanko, 2003). Titles such as *A Nation at Risk* (Gardner, Larsen, & Baker, 1983), *Before It's Too Late* (National Commission on Mathematics and Science Teaching for the 21st Century, 2000), *Rising Above the Gathering Storm* (National Research Council, 2007a), and *Science in the National Interest* (Clinton & Gore Jr., 1994) capture the driving forces behind science and mathematics education policy at different points in recent history. In the past two decades, STEM education policy documents have demonstrated frequent concern about the United States' ability to maintain the highest economic privilege in a global market in which STEM disciplines play a vital role.

During the same time period, the population of the United States has experienced unprecedented demographic shifts. The latest U.S. Census Bureau (2012) analysis indicates that the United States will become a majority–minority nation by 2043; that is, within the next three decades Peoples of Color will collectively outnumber Whites nationally. Furthermore, the United States is predicted to reach majority–minority status for children under the age of 18 much sooner, by the year 2019 (U.S. Census Bureau, 2013). Higher numbers of Students of Color are entering college with aspirations of pursuing STEM disciplines now than any time in the past decade, in certain situations equaling participation of White and Asian American students (Hurtado, Eagan, & Chang, 2010). However, according to the National Science Foundation (2013), Black, Hispanic, and Native individuals collectively make up only 13% of the STEM workforce nationwide and only 16% of all STEM undergraduate degrees awarded.

National policy reports serve as a vehicle by which Congress and other vested parties advance their agendas (Spillane, 2008), so understanding the ways in which Students of Color have historically been treated in national STEM policy reports may help to reveal the position Students of Color have in these agendas. This analysis is of particular importance to the potential shift in K–12 STEM education illustrated in recent documents such as the 2010 PCAST report, the *Framework for K–12 Science Education: Looking Toward the Future of Science Education* (Schweingruber, Quinn, Keller, & Pearson, 2013), and the *Next Generation Science Standards* (NGSS Lead States, 2013).

In this paper, we analyze discussions related to Students of Color in 17 prominent national STEM education policy reports over the past two decades. We begin by reporting on the instances of selected keywords related to equity, race, and ethnicity discussions in each document. We then describe how Students of Color have been framed in these reports and use the lens of critical race theory (CRT) to analyze these descriptions. We conclude with

implications and recommendations for future STEM education policy reports based on our findings. We posed the following two questions to guide our research:

1. How are Students of Color characterized in recent STEM education policy reports?
2. What does a CRT analysis of these characterizations reveal about the dominant views of and implications for Students of Color in STEM policy documents?

THEORETICAL FRAMEWORK

CRT emerged out of critical legal studies in the 1970s as a scholarly response to the lack of attention given to the roles race and racism play in societal structures (Crenshaw, 2011; Delgado & Stefancic, 2012). Formalized in 1989, CRT scholarship incorporates history, sociology, economics, political science, and other disciplines to understand and ultimately deconstruct the ways in which systemic racism works to entrench, adapt, and replicate itself (Decuir & Dixson, 2004; Gotanda, 1991; Leonard, Napp, & Adeleke, 2009; Leonardo, 2011, 2012; D. Martin, 2006; Rosebery, Ogonowski, DiSchino, & Warren, 2010; Stinson, 2008; Tate, 1994; Williams, 2009). Although CRT is arguably a relatively new theory, the ideas and visions that compose CRT have been explored and written about for over a century, dating back to Du Bois (1903) and Woodson (1933). CRT directly challenges the notion that we live in a postracial society. CRT not only explicitly identifies race as a social fact and highlights the permanence of systemic racism—i.e., higher loan rates provided to Peoples of Color (Cavalluzzo, Cavalluzzo, & Wolken, 2002), disparate educational resources, food deserts (Guthman, 2008; Slocum, 2010), etc.—but also asserts that these conditions serve a purpose, are ordinary parts of the everyday lives of most People of Color in the United States, and that these conditions did not occur by accident (Bell, 1992, 2004; Delgado, 2001). When operationalized, CRT has served as a powerful tool to help us understand and ultimately work to dismantle the practices of structural ideologies of systemic and endemic racism in education practice and policy (Crenshaw, 2011). As CRT has expanded its scope into different disciplines it has taken on multiple iterations: "like other intellectual and political movements, there is not a common doctrine to which all members of CRT subscribe but there are unifying purposes" (Parsons, Rhodes, & Brown, 2011, p. 953).

In this paper, we draw upon four common themes in CRT:

(a) The concept of *interest convergence*—racism persists because it serves the material interests of elite Whites and the psychic interests of working class and poor Whites, and as such we cannot expect racism to cease without better understanding and disrupting this fact (Bell, 1980, 2005).

(b) The concept that race is a social construction, not a biological one[1] (Delgado, 2001).

(c) The practice of challenging dominant ideologies of objectivity, color blindness, *science-for-all*, and *mathematics-for-all* rhetoric, and other similar claims, which often act as camouflage for continued replication and expansion of the power and privilege of dominant structures and groups (Solórzano & Yosso, 2001).

[1]Because of its social construction, race is difficult to define. Omi and Winant (1994) state, "Everyone "knows" what race is, though everyone has a different opinion as to how many racial groups there are, what they are called, and who belongs in what specific racial categories" (p. 3). Offering an attempt at an academic definition, they state, "... race is a concept which signifies and symbolizes social conflicts and interests by referring to different types of human bodies. Although the concept of race invokes biologically based human characteristics (so-called "phenotypes"), selection of these particular human features for purposes of racial signification is always and necessarily a social and historical process" (p. 55).

(d) Understanding that our society is based on property rights and that Whiteness[2] (i.e., the ability and privilege to own and operate material goods and spaces, products of labor and intellectual property) is in and of itself a form of property—a privilege not historically afforded to Peoples of Color (DeCuir & Dixson, 2004; Harris, 1995a, 1995b; Ladson-Billings & Tate, 1995). As such, the material goods and spaces, products of labor, and intellectual properties of Peoples of Color often fall under the ownership of the owners and operators of Whiteness, maintaining a White-over-color ascendency (Leonardo, 2002). We refer to this process and the ways it is replicated and expanded as *racial commodification*.

We identify *racial commodification* as an enacted practice, i.e., one of the methods by which the racialized power hierarchies in the United States have historically replicated themselves and continue to do so today. Along with *racial commodification*, we also identify the enacted practices of *differential racialization*, i.e., Whiteness racializes different groups of people in different ways at different times in response to changing needs; and *racial essentialism*, i.e., dominant society works to ascribe both groups and individuals of color "a single, easily stated, unitary identity" (Delgado & Stefancic, 2012, p. 4). We discuss these enacted practices in further detail below.

CRT in STEM Education and Education Policy Research

Legal scholars such as Bell (1992, 2004, 2005), Delgado (1990, 2000, 2001, 2011), Crenshaw (1991, 2011), and Crenshaw, Gotanda, Peller, and Thomas (1995), among others, have made significant contributions to the development of CRT in ways that have influenced CRT's applications in education (Tate, 1997b). Since its introduction to education research (Ladson-Billings & Tate, 1995), CRT has established a strong and growing presence in the field (Bonilla-Silva, 1997; DeCuir & Dixson, 2004; Ladson-Billings, 2005, 2012). Multiple scholars have utilized CRT to better understand racial structures among African American, Latino/a and Asian American students and communities, and to expose the ways practices, policies, and procedures in education (such as color-blind approaches to teaching) have worked to maintain and expand racism and racialized power hierarchies (Jain, Herrera, Bernal, & Solórzano , 2011; Kohli & Solórzano, 2012; Leonard & Evans, 2008; Leonardo, 2011, 2013; Martin, Gholson, & Leonard, 2010; Solórzano & Ornelas, 2002; Yosso & Ravine, 2007; Yosso, 2005; Yosso, Smith, Ceja, & Solórzano, 2009).

In mathematics education policy specifically, two authors' works are most relevant here. Gutstein (2009, 2010) has examined several mathematics education policies and policy documents using critical theory and several tenets of CRT. He argues that the policies he reviewed are motivated primarily by the desire to maintain global economic superiority against the rising educational and intellectual infrastructure of other nations. The documents call for increases in K–12 mathematics education spending with foci on college-track students, Advanced Placement tests and courses, and qualified teachers to teach these courses. While the documents themselves claim success will benefit all citizens, Gutstein argues that only those with the most wealth have received any financial benefit from these endeavors. Gutstein cites stagnant wages, decreasing numbers of jobs, and a lack

[2]The term Whiteness does not implicate any one individual but rather a system of structures and perspectives that inform a dominant hegemonic project. Although White peoples (and other individuals afforded limited access to Whiteness) often engage Whiteness in ways that benefit and privilege them, some individuals also engage Whiteness in critical, deconstructing ways—a necessary component in beginning to dismantle the dominant hegemonic project. (See Leonardo (2002, 2011) for further discussions on Whiteness.)

of attention to the needs of urban schools as specifically affecting Latina/o and African American students, perpetuating the continued systemic racism in mathematics education and society as a whole.

Danny Martin (2003, 2009a, 2009b, 2013) has examined the many ways in which mathematics education federal policy documents have worked to erase the lived experiences of African American students. In his research, he has found that mathematics education policy and policy documents promote a market enterprise working for the financial benefit of a select few. He argues that, through interest convergence, mathematics education policy documents align nationalism with Mathematics-for-All rhetoric and calls for increased national defense with racial projects and agendas. Furthermore, he argues that several education policy documents have aligned mathematics illiteracy with African American and Latina/o students as a threat to the United States' economic well-being, prosperity, and power-elite status. According to Martin, the few moves made toward improved access to mathematics education for African American and Latina/o students are engineered to allow only a few to enter through the gateway of assimilation into White institutional spaces instead of promoting equitable mathematics education policies. Even these allowances, Martin states, are afforded only for the economic benefit of the elite.

Several scholars have used a CRT lens to specifically examine issues of race and racism in facets of education policy. Vaught (2008) has used a CRT framework to examine ways in which certain district policies have worked to commodify Black children through what she calls a differential student funding structure. López (2003) observes that while CRT has made significant inroads in education research, it has yet to significantly impact education policy research and analysis. He argues that modern racism is fully present in education policy and has been almost completely ignored by education policy researchers and analysts. We take the works of these scholars in CRT as a foundation for our research. As such, our research aims to contribute to an emerging body of literature addressing this gap and to address the dearth of CRT research in science education (Parsons et al., 2011). By using a CRT perspective to inform our analysis, we are able to uncover and consider the implications of some of the racialized structures embedded in the STEM education policy documents we examined. Furthermore, our findings may lay the foundations for future critical work in STEM education policy analysis as well as contribute to expanded efficacy of CRT in education and STEM education research. This work also stays true to the social justice component of CRT, as DeCuir and Dixson (2004) state: "through uncovering covert racist practices and the policies that support them, educators, students, families, and communities are able to devise strategies to counteract, resist, and/or forestall those practices' and policies' effects" (p. 30). In this study, using the principles of CRT as an analytic and explanatory tool, we have identified the enacted practices of *racial essentialism*, *racial commodification,* and *differential racialization* in the STEM education policy documents we examined. We discuss each of these three practices below.

Racial Essentialism

Omi and Winant (1994) define *essentialism* as a "formulation which sees race as something objective and fixed, a biological datum" (p. 55). *Racial essentialism* is a practice designed to attempt to use skin color and other physical attributes to scientifically ascribe a set of static characteristics, often to justify certain social conditions. It is important to understand that this definition of racial essentialism extends deeper into racialized social practices than a connotative, everyday definition of "essentialism" may imply.

Racial essentialism is not the practice of simply lumping multiple groups of individuals together to make generalized statements about them, which itself is not inherently racist.

For example, a federal STEM policy document could make the statement that "scientists and engineers of color have a rich history of discovery, invention and innovation with positive impacts both in and out of their communities." This statement, while grouping together individuals of various racial, ethnic, geographic, and gendered backgrounds, does so to attribute a set of shared merits, not to ascribe a set of reductionist characteristics. According to Omi and Winant (1994), "it is important to distinguish racial awareness from racial essentialism. To attribute merits, allocate values or resources to, and/or represent individuals or groups on the basis of racial identity should not be considered racist in and of itself" (p. 71). If we consider the converse of the example statement, "scientists and engineers of color have a sparse and poor history in their disciplines, often to the detriment of their own communities," we can see a stark difference. The second statement works to erase the accomplishments of not just individuals but entire groups of peoples. Omi and Winant (1994) state, "a key problem with essentialism is its denial, or flattening, of differences within a particular racially defined group" (p. 72). This practice is problematic when it asserts racialized notions such as "Asians are bad drivers" or "Blacks are naturally better athletes." When taken further it becomes even more destructive, making statements such as "minority boys just cannot perform well in school." In education policy briefs, we see a similar flattening of large groups of peoples, with documents often referring to women, minorities, and persons with disabilities collectively, ascribed with an epithet of *underrepresented*, and no further delineation or description of any of these already extremely broad categorizations of large groups of peoples.

In this paper, when we use terms such as "People(s) of Color," "Communities of Color," or "Students of Color" we do not mean to ascribe an all-encompassing, comprehensive set of attributes to the collectives of marginalized and historically oppressed peoples. Rather, we recognize a set of shared experiences of exclusion, oppression, and violence as well as accomplishments, achievements, and advancements. We select these terms specifically to remain congruent with the language used over the past 30 years by prominent CRT authors. In our use of these terms in this paper, we are referring specifically to ways in which social research and policy "has been violent to marginalized peoples, such as indigenous groups, who are represented by perspectives that are neither kind to their cultural worldview nor accurate regarding their priorities" (Leonardo, 2013, p. 5). Here, we are using a binocular lens that simultaneously recognizes a common set of experiences (which helps to define the group) and also the significant variability within (K. D. Gutiérrez & Rogoff, 2003). In contrast, in the policy documents we examined, we see a racially essentializing monocular lens being used consistently.

Racial Commodification

Bridges (2002) states that "commodification is the *conceptualization* of the body as a commodity" (p. 129). This includes the rhetoric that surrounds the body, the work done, and the products produced by the body. In other words, the commodification of Peoples of Color includes the process of affixing a market value to the collective potential labor and intellectual property of marginalized racialized groups (i.e., Blacks, Latinos, etc.) for the benefit and profit of those assigning the value (i.e., White property owners and operators). It is important to note that at certain times of higher than normal economic affluence, the White market value of this collective labor and intellectualism can be at or near zero. As such, this fluctuating process works to "promote the ejection of the Black [and Brown] body from White spaces as evidenced by 100 years of ghettoization . . . unless they serve the commodification of blackness within White capitalism" (Leonardo, 2013, p. 9). In this paper, we identify ways in which STEM education policy documents have racially

commodified Students of Color, at times as an intellectual labor resource and at other times with near-zero market value. This is significant as these reports inform and promote the idea that through

> policies and practices that restrict the access of Students of Color to high-quality curricula, and to safe and well-equipped schools, school districts have served to reify this notion of Whiteness as property whereby the rights to possession, use and enjoyment, and disposition, have been enjoyed almost exclusively by Whites. (DeCuir & Dixson, 2004, p. 28)

Differential Racialization

Delgado and Stefancic (2012) define *differential racialization* as

> the ways the dominant society racializes different minority groups at different times, in response to shifting needs such as the labor market. At one period, for example, society may have had little use for blacks, but much need for Mexican or Japanese agricultural workers. At another time, the Japanese, including citizens of long standing, may have been in intense disfavor and removed to war relocation camps, while society cultivated other groups of color for jobs in war industry or as cannon fodder on the front. Popular images and stereotypes of various minority groups shift over time, as well. In one era, a group of color may be depicted as happy-go-lucky, simple-minded, and content to serve white folks. A little later, when conditions change, that very same group may appear in cartoons, movies, and other cultural scripts as menacing, brutish, and out of control, requiring close monitoring and repression. (p. 3)

We see in Delgado and Stefancic's examples the ways in which various Peoples of Color are treated as a commodity and assigned whatever characteristics best suit the ways Whiteness intends to use those groups at the time. Expanding Delgado and Stefancic's examples, when they were needed to work the fields, Black peoples have been portrayed as content to serve. When needed to work factories, Black peoples were treated as able-bodied but not intelligent or even fully human. As industry began to leave the United States, a slow process beginning in the late 1950s and early 1960s and continuing through today, the narrative of the Black work ethic (Black peoples portrayed as "lazy") began to become more prevalent (Wilson, 1997). When needed to fuel a private prison industry complex, Black peoples were/are assigned personas of criminal brutes in need of sequestering into ghettos and then prisons (Alexander, 2012; Rios, 2011).

To understand *differential racialization* more clearly we can look to the historical precedent of America's wartime exploitation of Peoples of Color. The Massachusetts's 54th Volunteer Infantry of the Civil War, the Tuskegee Airmen, and Navajo Code Talkers of World War II are better-known examples of Peoples of Color called and allowed into military service at a time of high need while still being subjected to oppressive measures at home such as Jim Crow laws. Another salient example, the Bracero Program, brought thousands of Mexican laborers into the United States during the dire need of World War II; soon after this need had ended, however, the United States attempted to extradite them. This exploitation of Peoples of Color is part of our history and woven deep into the cultural fabric of the United States. While it may seem like a stretch to look to these wartime examples as congruent with the *differential racialization* of Students of Color in STEM fields, we can look to the foundation of modern STEM education, the National Defense Education Act (NDEA) of 1958, to see the call for improvements in STEM education to support the continued military defense of our country, and that document's racialized educational impact (see Tate, 1997a). As the most militarized country in the world, we cannot overlook

the fact that this military motivation for improved STEM education must still be in play to some degree today.

In these examples, we see where the notions of *property rights of human capital*, *racism as an ordinary practice*, *white-over-color ascendency*, and *differential racialization* converge to generate a dominant ideology of Peoples of Color as an economic commodity. As CRT suggests, race as a construct and its placement in the white-over-color hierarchy is always changing to accommodate Whiteness.

As a last consideration, we also note that we ourselves (the authors of this paper) are a product of and working within a racialized project and as such cannot hope to fully escape engaging in some of these racialized practices, despite our own identities as members of marginalized groups. Rather, we hope to begin to disrupt some of these processes and make visible the racialized practices in the federal STEM education documents we have examined.

CHARACTERIZATION OF STUDENTS OF COLOR IN STEM POLICY DOCUMENTS

We selected 17 documents for our analysis using several selection criteria, including having an expressed STEM focus, the date of publication, and affiliation and affinity to the federal government (see the Appendix for further descriptions of our methods). In this section, we present the results of our analysis. First, we present relevant results from counts of select equity, race, and ethnicity keywords across all documents, highlighting the most common and least common keywords. Second, we present the results of our coding analysis of keyword instances.

Keyword Counts

Using an iterative approach, we identified and selected 12 keywords, which related to discussions of Students of Color and tabulated each occurrence of these keywords (see Table 1). The two most frequently occurring keywords were *minorit(y/ies)* and *underrepresented*, and the most infrequent keyword was *Latino.* The keyword *minorit(y/ies)* was the only consistently occurring keyword in all of the 17 documents we examined. These findings have significance when analyzed with a CRT framing, which we unpack in the next section.

In addition to tabulating total instances of each keyword, we also calculated the average number of keywords per page for each document we analyzed to make comparisons across documents. We graphed the results in chronological order (see Figure 1). Here we see variations in the number of keywords ranging from close to 1.2 keywords per page down to less than 0.1 keywords per page. We also see possible cyclical patterns over time. For example, documents published in 1996 and 1997 all have values of around 0.6 keyword per page (a relatively higher ratio), whereas the next grouping of documents from 2000 to 2003 all have values of around 0.1 keywords per page (a relatively low ratio). These cycles may have ties to the political and social conditions as well; however, further research is needed to investigate this claim.

This graph illustrates the possible cyclical nature of the frequency of discussions about Students of Color in STEM education policy documents.

Category Counts

Using an iterative coding approach (see the Appendix for full description), we coded each of the keyword instances using our CRT framework as a guide. We identified two

TABLE 1
Selected Keyword Counts per STEM Education Policy Document

STEM Education Policy Document Title (Abbreviated) by Year		Selected Equity Keywords												
		Minor-it(y/ies)	Underrepre-sent(ed)	Ethnic (ity/ities)	Hispanic	Socioeconomic	African American	(In) equity	Race	Black	Under-serv(ed)	Native	Latino	Total
1994	Science in the National Interest	1	6	0	0	0	0	0	0	0	0	0	0	7
1996	From Analysis To Action	9	7	1	0	1	0	1	0	0	0	0	0	19
1996	Shaping the Future	22	9	1	2	0	1	1	0	2	0	0	0	38
1997	Report to the President	2	0	18	14	17	5	6	12	2	0	1	0	77
2000	Before it's Too Late	1	0	0	0	0	0	0	0	0	0	0	0	1
2001	Adding It Up	6	0	12	11	6	8	1	2	2	1	5	1	55
2003	Bio2010	7	2	2	1	0	1	0	0	0	0	0	0	13
2003	Evaluating & Improving Undergrad Teaching	1	0	0	0	0	0	0	1	0	0	0	0	2
2005	Educating the Engineer of 2020	7	7	2	1	0	6	0	0	1	0	0	0	3
2005	Tapping America's Potential	1	2	0	0	0	0	0	0	0	0	0	3	27
2007	Academic Competitiveness	1	0	1	2	0	0	0	0	2	3	0	0	23
2007	Building a STEM Agenda	5	3	3	1	4	0	0	3	1	3	0	0	9
2007	Gathering Storm	15	12	3	3	1	2	0	0	2	5	0	0	43
2007	Taking Science to School	10	4	6	2	8	0	4	2	6	3	1	1	47
2008	Foundations for Success	4	3	2	5	3	5	0	4	0	0	0	0	26
2009	Engineering in K–12 Ed	24	20	6	10	2	13	1	0	1	0	2	1	80
2009	Learning Science in Informal Environments	3	9	12	0	5	5	20	3	1	4	10	2	74
Total		119	84	69	52	47	46	34	27	20	19	19	8	544

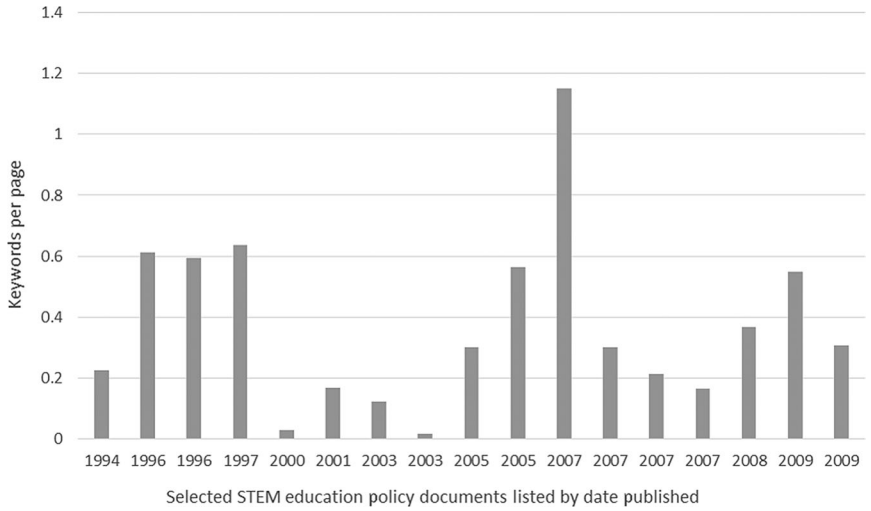

Figure 1. Keywords per page per document (listed chronologically by publication date).

overarching categories. Our first category, based on the theme of *racism as an ordinary practice in our society* (Delgado & Stefancic, 2001), was *statements of the presence and problem of underrepresentation*. This category did not include any instances of justifications, analysis, or further discussions of underrepresentation; only statements of the existence of underrepresentation or that underrepresentation could be an issue of concern. Statements, such as "Hispanic students, for example, appear to be singularly disadvantaged, attending schools with significantly fewer computers per student than average, particularly at the elementary school level" (President's Committee of Advisors on Science and Technology, 1997, p. 75) are common iterations of this category. The majority of uses (325 instances) of the keywords we examined fell into this category.

Our second category included all reasons offered to make changes to underrepresentation in STEM fields. This broad category occurred 219 times. We applied a second tier of coding to this category and derived three subcategories. We present these results in Table 2. The most prevalent of these subcategories were calls for changes in underrepresentation for the purpose of *economic benefit to the state*, occurring 157 times. This code indicates discussions surrounding keywords that positioned Students of Color as a racialized commodity. An example of this category from *Engineering in K–12 Education: Understanding the Status and Improving the Prospects* (National Research Council, 2009a) discusses the disparate representation of women and minority students in engineering fields:

> This situation has many people in the engineering community worried about the future supply of engineers, especially as the U.S. population becomes increasingly diverse. Some have expressed a concern that other countries—particularly China and India—have been outpacing the United States in the production of engineers. (p. 34)

The least common of our three subcategories, *STEM experience as a direct benefit to Students of Color*, occurred only one time. This category includes statements with a humanitarian view of Students of Color and/or statements promoting a STEM education for benefit of the betterment of the individual. The only instance of this category comes from *Learning Science in Informal Environments* (National Research Council, 2009b):

TABLE 2
Tabulated Results of Coded Reasons Given to Increase the Number of Students of Color in STEM

STEM Education Policy Document Title (Abbreviated) by Year	Economic Benefit to the State	Diverse Perspective as a Benefit to STEM Enterprise	STEM Experience as Direct Benefit to Students of Color	Total
1994 Science in the National Interest	7	0	0	7
1996 From Analysis to Action	0	1	0	1
1996 Shaping the Future	20	5	0	25
1997 Report to the President	5	0	0	5
2000 Before it's Too Late	0	0	0	0
2001 Adding It Up	17	2	0	19
2003 Bio2010	2	11	0	13
2003 Evaluating & Improving Undergrad Teaching	2	0	0	2
2005 Educating the Engineer of 2020	20	6	0	26
2005 Tapping America's Potential	3	0	0	3
2007 Academic Competitiveness	9	0	0	9
2007 Building a STEM Agenda	23	0	0	23
2007 Gathering Storm	8	1	0	9
2007 Taking Science to School	13	15	0	28
2008 Foundations for Success	2	1	0	3
2009 Engineering in K–12 Ed	26	0	0	26
2009 Learning Science in Informal Environments	0	19	1	20
Total	157	61	1	219

> Informal science learning experiences are believed to lead to further inquiry, enjoyment, and a sense that science learning can be personally relevant and rewarding. Participants in them are diverse and include learners of all ages, cultural and socioeconomic backgrounds, and abilities . . . Ideally these experiences enable learners to connect with their own interests, provide an interactive space for learning, and allow in-depth exploration of current or relevant topics "on demand." (p. 11)

This example promotes STEM education and experiences for the benefit of enjoyment, personal relevance, personal reward, and a continued interest/inquiry in STEM to extend these experiences. This example also demonstrates ways of identifying cultural and socioeconomic groups of peoples in less essentializing ways, identifying the shared experiences of STEM learning while honoring in-group variations that may exist in interests and relevant topics.

In summary, we first found *minorit(y/ies)* and *underrepresented* were the most frequently used keywords and *Latino* was the most infrequent keyword. Second, we found the ratio of keywords per page for each document fluctuated over time in potentially cyclical patterns. Third, the most prevalent reason presented for an increase in Students of Color in STEM fields was for the *economic benefit to the state* and the least prevalent reason, *STEM*

experience as a direct benefit to Students of Color, occurred only once in all of the 17 documents we analyzed.

ANALYSIS

In this section, we present an analysis of our findings using our theoretical framework. First, we examine and problematize the frequency and use of keywords indicating racial categorization. Next we examine the most frequently used keywords with consideration to the enacted practice of *racial essentialization*. Third, we analyze *economic motivation* (the most common coded category) and the variation in the ratio of keyword usage in documents across time, through the enacted practices of *racial commodification* and *differential racialization*.

Keywords Indicating Racial and Ethnic Categorization

Ethnicity, like race, is a social construction whose definition has changed over time. According to Omi and Winant (1994), ethnicity has historically been "the result of a group formation process based on culture and descent" (p. 15) and over time, as cultural practices, language, and even heredity were lost, ethnic groups have also become interest groups. While White ethnicities delineate many different subgroups, historically Black, Latino, Native, and Asian peoples have typically not been afforded similar subgroups. For example, descendants of immigrants from an island off the coast of Europe who share similar cultural components and interests were given an ethnicity of Irish American, whereas all individuals with certain phenotypical features, regardless of their cultural or interest similarities, are assumed to be connected to entire continent of peoples and ascribed a racialized "ethnicity" of Black or Negro.

As discussed further in the next section, when the documents we examined used more specific terms than *race* and *ethnic(ity/ies)* or even the even broader term *minority(ies)*, they did so often only to disaggregate statistical data. In comparing the various terms used to indicate particular racial and ethnic groups, we found differing trends.

First, we examined the uses of the terms *Hispanic* and *Latino*. Coined by the U.S. Census Bureau around 1970 (Ennis, Ríos-Vargas, & Albert, 2011), *Hispanic* is used to broadly label Spanish-speaking peoples, including those from Spain and those from places previously colonized by Spain. Conversely, the term *Latino* refers to peoples from Central America, South America, and the Caribbean Islands who are separate from Spanish peoples—the historical colonizers (Hayes-Bautista & Chapa, 1987). In grouping all individuals whose qualifying shared experience is Spanish colonization for the purposes of understanding their interactions and access to STEM education, using the term *Hispanic* may work to maintain and replicate the white-over-color ascendency in education described by Ladson-Billings and Tate (1995). Conversely, the term *Hispanic* is more recently used in government identification documents to label individuals with an ethnicity first (e.g., choose one of the following: *Hispanic, non-Hispanic*) within which race may reside (e.g.,. now select one of the following: *White, Black, Native*, *or Asian*). In these instances, *Hispanic* used as an ethnicity erases Latino as a race (Omi & Winant, 1994). In the documents we examined, the term *Hispanic* was used 6.5 times more often than the term *Latino*.

The second racial categorization keyword we examined was *Native*. The term *Native American* is used to describe a vast array of peoples across the continental United States, Hawaii, and Alaska, with 566 separate tribes recognized by the federal government (U.S. Bureau of Indian Affairs, 2014). It is a collective with a population expected to double in the next half century (U.S. Census Bureau, 2012). In the 17 documents we examined, the term

Native occurred 19 times (approximately one third less often than terms meant to indicate other racial categories). Of those 19 occurrences, 10 of them occurred in *Learning Science in Informal Environments: People, Places, and Pursuits* (National Research Council, 2009b). This document, which we look at more closely later in this paper, devoted a specific section to address and celebrate the indigenous STEM knowledge of Native peoples. With the exception of this section (which may perhaps serve as a beginning model for future STEM policy documents), the unique experiences and rich knowledge bases of the many different Native peoples in our country are almost completely invisible in the documents we examined.

Our third examination was a comparison of the keywords *African American* and *Black*. B. Martin (1991) describes *Black* as a term brought to prominence in the 1960s as a part of Black radicalism, nationalism, and reclamation to replace the term *Negro*. B. Martin writes, "In addition to imposing new language on whites, it aimed at black mobilization and self-assertion" (p. 90). Ultimately the term, because of its racialized phenotypic nature, was assimilated into White dominant discourses and continued to at times create tensions within Black communities between subgroups which B. Martin describes as lighter and darker-skinned Blacks.

According to B. Martin (1991), *African American* (a relatively new term at the time of his writing) was introduced to the mainstream in 1988 by multiple Black political leaders as a way to lay claim to cultural heritage(s) of traditions, practices, languages, histories, and lineages. Because of the unique experiences of slavery, many Black Americans do not have access to their own individual lineages and generational cultural practices from their familial homelands inside of the African continent. Slavers did not permit the practices of or transmission of native languages, customs, adornments, celebrations, etc. generationally. Without cultural identities, peoples of African descent were historically positioned with a racial identity only and as such were denied cultural legacies, accomplishments, and celebrations. This is significant not only because of its effects on Black individuals in the creation of identity but also in the discourse surrounding racialized biological and cultural hierarchies. Against a robust set of achievements and accomplishments attributed to various White ethnicities, the "ahistorical," "cultureless" nature of a Black racial collective was positioned as inferior and thus became another justification for white-over-color ascendency (Muhammed, 2010). The term *African American*, as part of Black liberalism, provided Black peoples with a "new ethnicity"—a connection and a claim to the rich histories, achievements, innovations, cultural practices, power, and pride of the African diaspora (B. Martin, 1991). Pinderhughes (1989), a sociologist writing at the time the term *African American* was emerging, reported that one of her research subjects had begun referring to herself as African American "because it was a 'more clear reference to my heritage and culture, as opposed to Black which describes my skin color'" (p. 47). As such, the term *African American* is meant to be akin, with all the same cultural and political affordances, to ethnicities such as Italian American, Irish American, and Chinese American.

In the documents we examined, the term *African American* was used 2.3 times more often than the term *Black*; however, there is no discernible time-based trend in the frequencies of either term or in their ratio to one another. Seven of the documents we examined used both *African American* and *Black*. Those documents used the terms seemingly interchangeably, but not together (e.g., no statements that say "*Black* or *African American*"). Additionally, the documents we examined showed no consistent indication of discerning *Black* versus *African American* with regard to race versus ethnicity. Of the 12 documents which used at least one of the terms *Black* and *African American*, three of them labeled *African American* as an ethnicity; three labeled them together as both a race and an ethnicity; one document labeled both *African American* and *Black* as an ethnicity; two documents only labeled *Black*

as an ethnicity; one labeled *African American* as a race; and one offered no labels at all for its uses of *African American* and *Black*. There were no discernible temporal trends in these variations. We found similar results in comparing the terms *Hispanic* and *Latino*. These findings suggest that STEM education policy document authors are potentially not aware or conscious of, or perhaps do not place value in their uses of, terms in identifying various groups of Peoples of Color.[3]

Racial Essentialism in STEM Education Policy Reports

The policy reports we examined predominantly used broad-based, generalizing language, with the keywords *minority/ies* and *underrepresented* together accounting for over a third of the total keyword count. These kinds of generalizing words and language in policy documents may often appear to address issues pertinent to all U.S. citizens. However, this "science-for-all" view, while potentially appearing to be inclusive, is an example of racial essentialism, meaning the generalizing language of "science-for-all" or "math-for-all" works to erase the continued injustices, segregation, and exclusion experienced by Students of Color (Barton, 1998). The following statement, for example, may appear to include all who dwell in the United States:

> The principal sponsors and beneficiaries of our scientific enterprise are the American people. Their continued support rooted in the recognition of science as the foundation of a modem knowledge-based technological society is essential. The nation's investment has yielded a scientific enterprise without peer whether measured in terms of discoveries, citations, awards and prizes, advanced education or contributions to industrial and informational innovation. Our scientific strength is a treasure which we must sustain and build on for the future. (Clinton & Gore Jr., 1994, p. 7)

While statements like these may not appear overtly or easily identifiable as exclusionary, they contain the assumption that all peoples of the United States invest in and benefit from our scientific enterprise. By asking the question as scholars, "Who exactly benefits from those awards and industrial and information innovations?," we may see a "same-as-fairness" approach to STEM education policy. This "sameness-as-fairness" approach to policy (K. D. Gutiérrez & Jaramillo, 2006) works to the benefit of only those who already own and employ STEM enterprises.

Using broad language such as *minority/ies* and *underrepresented* terms, policy writers and readers often lump women, Peoples of Color, peoples from low socioeconomic backgrounds, and those with disabilities together. Additionally, in using terms such as *minority/ies*, the reader is often left to assume this term is meant to indicate race. This assumption is problematic because (a) the reader is left to interpret, and in some cases to guess, exactly who the minorities are and (b) placing together all of these groups of people works to erase the shared experiences of and the unique in-group experiences of various Peoples of Color, and to thus hide the very real issues of institutional racism and prejudicial structural practices in educational spaces (D. Martin, 2009a). According to Lee and Buxton

[3]Of note: the 2001, 5th edition of the *APA Publication Manual* (which would potentially have informed 12 of the documents we examined) instructs writers to be as specific as possible when referring to race and ethnicity, asking for specific terms whenever possible such as Cuban or Central American over Hispanic, Latino and Chicano; tribal affiliations over American Indian and Native American; Chinese, Vietnamese, Korean, Pakistani, etc. over Asian and Asian American. For people of African ancestry, it asks for the terms Black and African American over Negro and Afro-American because the latter terms have become outdated and are possible pejorative. Unlike each other race addressed, the manual does not ask for further ethnic delineations of Black or African American.

(2010), racially essentializing large groups of students may have detrimental effects by justifying the exclusion of certain races and ethnicities to interventions and tutorials that help students achieve academic success in science. For example, *Science in the National Interest* (1994) states,

> Women, minorities and those with disabilities are underrepresented in most fields of science, mathematics, and engineering with respect to their proportions in the population.... It will be essential for the future well-being of the country and specifically of the scientific enterprise that we educate the twenty-first century scientific workforce by explicitly engaging participants representative of the nation's diversity. (p. 31)

This document only briefly addresses the issue of underrepresentation, and does so as a whole, offering no acknowledgment that the causes and solutions to what blocks various groups from entrance into STEM fields are different and unique. In the documents we examined, the term *minority/ies* could often broadly encompass any group or conglomerate of people that are not in the majority, whereas the term *race* was typically used to identify the broad collective of individuals identified as African American, Latino, and Native American. *Minority/ies*—the most frequently used keyword—occurred 4.4 times more often than the term *race*. Additionally, nearly half of the occurrences of race (12 of 27 total) were contained within one report (President's Committee of Advisors on Science and Technology, 1997). Even in using the term *race*, policy documents failed to provide any sort of cohesive definition of race. D. Martin (2009a) found similar results in the mathematics education documents he examined, further stating, "As is often the case, the concept of race was used only to disaggregate data so that it could be cited as a causal variable and used to rank students in a racial hierarchy of mathematical ability" (p. 16). Research on culture and learning (K. D. Gutiérrez & Rogoff, 2003) tells us that we must account for the regularity AND the variance within communities. Attending only to commonalities leads to a continued "one-size-fits-all" approach to science and mathematics education, which ultimately works to maintain and reproduce the racialized structures and outcomes already in place (see Mutegi, 2011). As D. Martin (2010) argues, this translates into "What is best for White students is best for all students." By predominantly using terms such as *minority/ies*, the STEM education policy documents we examined acknowledged neither the racialized issues in STEM education nor the lived experiences of those students on the receiving end of those racialized issues. Statements such as these are significant not only because of their static deficit narratives but also because of their influence in reproducing these notions. STEM education policy briefs may influence how researchers and program developers write grants, which in turn may influence how STEM education programs are operationalized (D. Martin et al., 2010).

STEM policy reports did occasionally delineate racial categories via statistics when stating the issue of underrepresentation. When used with little to no context, these quantitative approaches are problematic as well. In most cases, the statistics reported for African American, Latino, and Native American peoples situated them in a mathematically or scientifically inferior position to White and Asian peoples. This practice has been called "gap-gazing" by R. Gutiérrez (2008), who identifies it as a "fetish" (p. 357) of researchers and policy writers. According to R. Gutiérrez (2010), this gap-gazing "offers little more than a static picture of inequities, supports deficit thinking and negative narratives about marginalized students, accepts a static notion of student identity, relies upon Whites as a comparison group, divides and categorizes students, [and] ignores the largely overlapping distributions of student achievement" (p. 18). In one example, the *Report of the Academic Competitiveness Council* (U.S. Department of Education, 2007) states: "As in mathematics,

there are significant gaps between the scores of black and Hispanic students and those of white students" (p. 6). Another example in the document *Adding it Up* (National Research Council, 2001) demonstrates this deficit and negative narrative with salience:

> The same survey found large differences between ethnic groups on the more difficult tests (but not on the Level 1 tasks) with 70% of Asian and 66% of non-Hispanic white children passing the Level 2 tasks, but only 42% of African American, 44% of Hispanic, 48% of Hawaiian Native or Pacific Islander, and 34% of American Indian or Alaska Native participants doing so. Other research has shown that children from lower socioeconomic backgrounds have particular difficulty understanding the relative magnitudes of single-digit whole numbers and solving addition and subtraction problems verbally rather than using objects . . . This immaturity of their mathematical development may account for the problems poor and minority children have understanding the basis for simple arithmetic and solving simple word problems. (p. 178)

In this example, not only are the data presented in a deficit model but also the language surrounding the data position children of color in a static racial hierarchy, via what may be inferred as a biological deficit, with White children.

Furthering the positioning of Students of Color against White students, policy writers have across this span of time included Peoples of Color in language describing the failings of U.S. students in STEM. For example, several of the documents we examined associate the so-called achievement gap of Students of Color to White students with the United States' drop in science and mathematics test scores against international competition:

> International comparisons show that many U.S. students fare poorly relative to their peers in other countries. In addition, large achievement gaps between majority students and both economically disadvantaged and non-Asian minority students persist in all school subjects, and they are especially strong and persistent in science. (National Research Council, 2007b, p. 1)

This language positions non-Asian Students of Color as largely responsible for the United States' poor showing in STEM performance internationally. In another example of displaced blame, in *Innovation America: Building a Science, Technology, Engineering and Math Agenda* (National Governors Association, 2007) the paragraphs describing the United States' lagging international test scores are immediately followed by paragraphs detailing the persistent achievement gaps in underrepresented students. In a statement coming very close to openly placing the blame on the shoulders of Students of Color, the document claims, "Projected demographic shifts have the potential to magnify the U.S. problem if STEM achievement gaps are not rectified" (p. 6). By including racial achievement gaps next to international test scores in prose, as in the examples above, STEM education policy documents may be suggesting a causal link between the two. This is demonstrative of the ways in which racial essentialism leads to even more damaging practices of commodification and differential racialization, as these documents identify Students of Color as a potential resource to be harvested for economic gain while simultaneously laying blame on them for the continued lackluster performance of the United States in international STEM test scores.

Economic Benefit to the State

The most common calls for an increase in the number of Students of Color in STEM fields in the documents we analyzed fall under our category of *economic benefit to the*

state. This category predominantly includes racial commodification—statements that treat Students of Color as a collective form of property and a resource held in reserve to serve the economic benefit of those who own the STEM enterprise—and differential racialization (see the preceding section). Whites are disproportionately represented in the ownership and regulation of STEM fields and the intellectual property of science and mathematics. "[Students] must have the material resources that support their learning. Thus, intellectual property must be undergirded by "real" property: that is, science labs, computers and other state-of-the-art technologies, appropriately certified and prepared teachers" (Ladson-Billings & Tate, 1995, p. 54). These resources are disproportionately owned and facilitated by, and as such regulated and parceled by, Whiteness (Leonardo, 2004).

This is congruent with the claim that white-over-color ascendancy serves a purpose, that this is "'normal science,' the usual way society does business, the common, everyday experience of most people of color in this country" (Delgado & Stefancic, 2012, p. 3). The racial commodification of Students of Color in the documents we examined is built on the practices of racial essentialism—grouping all Students of Color together as a collective whole unit. It is facilitated further through differential racialization—viewing the collective of Students of Color as highly needed at times and nearly invisible at other times. This ordinary practice (Bonilla-Silva, 2005) is embedded, sometimes subtly and sometimes more overtly, in many of the documents we analyzed.

The STEM education policy report *Before It's Too Late: A Report to the Nation* from the National Commission on Mathematics and Science Teaching for the 21st Century (2000) states, "Among the first things Americans watch every morning on TV is the global marketplace at work" (p. 4). While not explicitly exclusionary, this statement suggestively defines "Americans" as those predominantly White, middle- and upper-class groups who have investment in ownership or the operation of the enterprise. Only those who have a vested interest in stock markets, the time, and the specialized knowledge to decipher stock market jargon have cause and ability to monitor the daily changes in the world's markets. With concerns focused on the Americans who follow global market changes and on corporate trends, policy writers do not appear to be heavily motivated by the improvement of the social condition for Peoples of Color, but rather by the lines and statistics of economic gain (D. Martin, 2013).

In the past 40 years, we have seen corporations systematically move industry and production jobs overseas, away from U.S. urban centers (Levine, 2011), leaving large numbers of Peoples of Color in these areas unemployed. Combined with a continued lack of access to innovations in health care and technological advancement, it is difficult to see the benefits that corporate economic gain and STEM innovation have delivered to Communities of Color. Furthering the notion of Students of Color as a resource available on demand for one-sided benefit, several documents have expressed the inclusion of Students of Color in STEM fields as a need necessitated out of sheer statistical numbers only:

> The percentage of whites will decline from the 2000 value of 75.6 percent to 63.7 percent. Looking even further into the future, by 2050, almost half of the U.S. population will be nonwhite. Thus, in 2020 and beyond, the engineering profession will need to develop solutions that will serve an increasingly diverse community and will likely need to (and should try to) draw more students from sectors of the community that traditionally have not been well represented in the engineering workforce. (National Research Council, 2005, p. 9)

Rather than a call for immediate inclusion out of ethical or moral grounds or for the benefit of people and communities of color, this document suggests the engineering enterprise will

not be able to continue to be viable as demographic changes occur. We are left to question as scholars why a decrease in the percentage of Whites in the United States is a cause to address racial exclusion from STEM fields. One potential answer is that in having control of STEM policies, practices, and knowledge, predominantly White owners and operators of STEM enterprises have not until now had anything to gain economically from changing embedded systemic racially exclusionary practices. D. Martin (2009b) states of his similar findings, this demonstrates "that workforce needs and the threat of demographic changes, not moral compunction, are often what drive increased attention to underrepresentation issues in mathematics and science" (p. 310).

The practice of differential racialization, or changing views of Peoples of Color across time to serve the needs and wants of White enterprises, is also visible when we look at keyword frequencies per document. The documents we analyzed exhibit notable variations in the frequency of discussions per document across time and in the ways they valued and devalued Students of Color as it suited the economic and scientific enterprises of the dominant culture at the time. As such, STEM education policies may choose to look to Students of Color as a vital part of our country's STEM future or to ignore their exclusion from STEM fields entirely as it coincides with "the cyclical debates of economic competitiveness and enlightened self-interest that typically are coupled with science and science education" (Tate, 2001, p. 1018).

We see evidence of differential racialization in the variation of the number of keywords used in these documents across time (see Figure 1). Through the lens of differential racialization we interpret this graph as describing historical trends in times when STEM enterprises perceived an economic need for Students of Color as an unused resource (high ratios of keywords per page) and times when Students of Color were not needed for economic benefit and thus became invisible to the STEM enterprises (low ratios of keywords per page).

By placing the figure in a sociohistorical context, we can also begin to explore the connections between differential racialization and historical, political, and economic trends. According to D. Martin (2013), previous research has already documented these connections between larger market-focused projects to mathematics education and policy. Our findings appear congruent. For example, Samuelson (2005) of the *Washington Post* called these fluctuations "The Sputnik syndrome .... It transforms a few selective economic happenings—a satellite here, a Toyota there, poor test scores everywhere—into a full-blown theory of economic inferiority or superiority." Samuelson wrote of the year 2005, "Americans are having another Sputnik moment: one of those periodic alarms about some foreign technological and economic menace." The policy documents we examined from 2005 had eight times more keywords than documents published just 2 years earlier (see Figure 1). This illustrates the alignment of perceived economic crisis among the users and makers of STEM education policy with subsequent call for more Students of Color in STEM fields.

Spillane (2008) has looked closely at the ways in which one of the documents we examined, *Foundations for Success: The Final Report of the National Mathematics Advisory Panel* (National Mathematics Advisory Panel, 2008), is positioned within the federal political landscape. He found that the document reflected and reified dominant central themes of the time in policy discourses and documents at the local, state, national, and international levels. As a place for further case-study research, we may ask to what extent this document, and the ones preceding and following it, may reflect the political positioning of the 2008 Presidential and Congressional elections, as well as the 2008 global financial crisis.

A Closer Look at Two Documents

As a final component of our analysis, we have selected two of our 17 documents to look at more closely with consideration to the racialized trends and themes we have identified across the documents collectively. We have selected two documents, each of which has unique components highlighted by our analysis. The first document is a salient example of the ways in which policy documents can erase the unique and varied experiences and perspectives of Students of Color from STEM education. The second document offers some components which may serve as positive, beginning models for future STEM education policy documents to build a discourse which works to deconstruct the racialized practices embedded in STEM education projects.

First, we examine *Tapping America's Potential: The Education for Innovation Initiative* (Business Roundtable, 2005), an economically oriented and crisis-focused document with a total keyword count of three. In this document, we see racial essentialism, racial commodification, and differential racialization in practice. The document uses two keywords, *underrepresented* and *minority*, a total of three times. Early in the document, it twice states a goal to "Motivate U.S. students and adults, using a variety of incentives, to study and enter science, technology, engineering and mathematics careers, with a special effort geared to those in currently underrepresented groups" (p. 2). In this example of racial essentialism, the document places all Peoples of Color together with any other group or subgroup not equally represented in STEM fields, suggesting that one "special effort" is necessary to solve the problem of underrepresentation in STEM education. This statement reifies and reproduces the practice of erasing the unique and varied experiences of Students of Color in STEM education we have seen in many of the documents we examined. Furthermore, by claiming that one "special effort" would offer at least some members of underrepresented groups access into predominantly White institutional spaces, it suggests that what is best for White students is best for all students (D. Martin, 2009a).

The third reference to Students of Color comes further into the document. Using the keyword *minority*, the statement is a unique instance of differential racialization. In the documents we examined, at times differential racialization came in the form of devaluing Students of Color through gap-gazing or deficit descriptions and at other times calling for Students of Color to enter into STEM fields for the benefit of the state or of the STEM enterprise. In place of these more common modes, *Tapping America's Potential* states, "The current local, state and national focus that No Child Left Behind has brought to closing the achievement gap between majority and minority students was long overdue and is beginning to pay off" (Business Roundtable, 2005, p. 8).

This claim, rather than devaluing Students of Color through deficit comments, attempts to erase race and ethnicity altogether by positioning STEM education as postracial. We did not find this type of differential racialization in any of the other documents we examined; however, it is congruent with the problematic color-blind and postracial stances mathematics and science education policy has taken historically (Ladson-Billings, 1998; López, 2003; D. Martin, 2009a; Tate, 1997a).

Tapping America's Potential, along with its dismissal of Students of Color, also engages in a unique version of commodification by looking to solve economic need for better innovation in STEM by attempting to acquire STEM graduates from other countries. The document frequently calls for Congress to "reform visa and immigration policies to enable the United States to attract and retain the best and brightest science, technology, math and engineering students from around the world to study for advanced degrees and stay to work in the United States" (p. 2). Here the document uses the phrase "best and brightest" which is interestingly reminiscent of the NDEA (1958). Emerging from NDEA policy:

"The political philosophy undergirding mathematics [and science] education reform was to invest resources in the students who were perceived as America's best and brightest" (Tate, 1997a, p. 258). According to Tate (1997a), this philosophy targeted White middle- and upper-class, college-bound male students as direct recipients of new and increased educational resources and opportunities. *Tapping America's Potential,* however, reassigns the phrase "best and brightest" to students from outside the United States. The document calls strongly for a political shift to allow STEM projects and enterprises to more easily import their resources. The document provides statistical data that demonstrate the high volume of STEM graduates around the world, an already-trained resource much more easily tapped into with reformed/relaxed immigration laws. This approach would require little to no increased investment into the U.S. education system. Rather, it looks to acquire STEM graduates from countries whose education systems are currently outperforming the United States. We do not suggest that recruiting talented groups of people outside of the United States is problematic on its own. However, when used as a main focus, potentially in place of addressing the continued denial Students of Color receive in attempting to access STEM education, this shortsighted approach can ultimately work to neglect the more difficult, but necessary, task of cultivating our own homegrown talent. *Tapping America's Potential* provides a unique example of the complex ways in which STEM education policy documents can position Students of Color through racial essentialism, racial commodification, and differential racialization.

The second document we analyzed was *Learning Science in Informal Environments: People, Places and Pursuits* (National Research Council, 2009b). Unlike *Tapping America's Potential*, this document takes unique steps to begin to deconstruct hegemonic structures in STEM education by providing a cultural context for science and mathematics through acknowledgment, identification, and celebration of the STEM learning, which takes place outside of classrooms. The document devotes a chapter to underrepresented cultures in formal STEM education titled "Diversity and Equity" with section headings including "Culture and Equity," "People with Disabilities," "Gender," and "Urban and Rural Environments." Unlike many of the other statements surrounding our keywords in other documents, *Learning Science in Informal Environments* cites relevant research in supporting their claims. The document as a whole is written with heavy emphasis on sociocultural perspectives (see K. D. Gutiérrez & Rogoff, 2003, R. Gutiérrez, 2010) for more on sociocultural perspectives in education and STEM education research).

Pushing against the color-blind structural racism of science-for-all and math-for-all rhetoric (López, 2003; D. Martin, 2009b), the document states, "Scientific discourse, teaching, and learning are not culturally neutral, although people tend to see and represent them as acultural or neutral or, in the case of science, as representing a unique culture unto itself" (p. 210). While the document works against racial commodification and racial essentialization to some extent, we find more nuanced examples of differential racialization present, in particular with the treatment of different racial groups and in the framing of race and ethnicity as cultural markers, ascribing structural racism in STEM enterprises as perceptions of certain cultural groups.

In its chapter on Diversity and Equity, *Learning Science in Informal Environments* affords markedly different types and volumes of discussions regarding underrepresented racial groups in STEM. The document devotes a section entirely to Native peoples, titled "Native Americans." In this section, the document points out that calls to recognize the indigenous STEM knowledge among various Native groups have been made for the past 30 years to little avail. The document acknowledges that knowledge among Native peoples has value and that that value should be recognized in formal STEM settings. The document even expressly warns against racial essentialism in addressing Native issues:

"It is important to keep in mind that there is not one native culture and to resist essentializing tribal cultures .... There are some similarities in the epistemologies and ontologies of different tribal peoples, but this does not imply that a single or unified native science or native epistemology characterizes all tribal nations or all indigenous people" (p. 224).

In contrast to the entire section devoted to Native peoples, African American and Latino students are only briefly addressed three times in this chapter, embedded in sections focusing on culture. African American peoples are referenced twice when synthesizing the work of other scholars. The first instance, in the section title "Diversity and Equity" highlights that speakers of African American vernacular English engage in complex reasoning and interpretation. The second instance, in the section titled "Learning is a Cultural Practice," highlights the cognitive gains African Americans make when playing dominoes. In these few references, the document does well to avoid racial commodification in its attempts to celebrate the STEM cultural capital that African American students bring with them into formal learning environments. The document mentions Latino peoples once in the "Science Learning in Informal Settings for Diverse Populations" section:

> As we have argued, informal settings for science learning are themselves embedded in cultural assumptions that may tend to privilege the worldview, discourse practices, and contextualizing elements of the dominant culture. People from nondominant cultural groups may tend to see these institutions as being owned and operated by this same group ... the lack of diverse staff, perceptions that content was not culturally relevant, and the unavailability of bilingual or multilingual resources—that resulted in second-generation Latinos feeling unwelcome in museums. (National Research Council, 2009b, p. 232)

Along with the differential attention paid to African American, Latino, and Native peoples, the document also attributes the idea that STEM institutions are owned and operated by the "dominant cultural group" as only a perception held by "nondominant cultural groups." By promoting the value of informal STEM knowledge and learning among Peoples of Color and simultaneously defining power differentials and structural racism in STEM enterprises as a perception held by certain cultural groups, the document engages in a contradiction.

Learning Science in Informal Environments addresses the ways in which increased diversity among science educators may work to deconstruct racialized structured and systemic racism in STEM fields and STEM education: "Diversity in the pool of scientists and science educators is critical. It will benefit science by providing new perspectives in research, and it will benefit science education by providing a better understanding of science" (p. 236). This call for a diverse teaching force is rarely made elsewhere in STEM and is of particular importance in its own right (Basile & Murray, in press). Additionally, the document also acknowledges the challenges in place for Students of Color entering into such heavily homogenized STEM fields, particularly in the physical sciences, something the other documents we examined failed to do. Students of Color who do gain access to STEM fields often turn away from that access, opting to avoid the marginalization and isolation of pursuing careers with such heavy White homogeny (Eisenhart, 2011). In sum, *Learning Science in Informal Environments* demonstrates a marked difference in the ways in which it addresses Students of Color over *Tapping America's Potential*. These documents may serve both as unique examples of racial essentialism, racial commodification, and differential racialization as well as two poles in the spectrum of documents we examined.

CONCLUSIONS

In this paper, we sought to examine how Students of Color were characterized in selected STEM education policy reports and what a CRT analysis of these characterizations revealed about the dominant views of and implications for Students of Color in STEM. Our examination revealed three main findings: (1) STEM policy reports predominantly used broadly defined, ambiguous keywords (e.g., *minority/ies* and *underrepresented*) in ways that racially essentialize Students of Color, erasing many of their shared and unique experiences; (2) the ratio of keywords per document fluctuated over time, appearing cyclical and potentially reflective of economic, political, and military national landscapes; (3) arguments for inclusive STEM education were made predominantly from a one-sided economic perspective, favoring the owners and operators of the STEM enterprise while humanitarian statements to create equitable access to and how Students of Color could themselves benefit from STEM access were virtually nonexistent. We found our analysis congruent with CRT's notion that U.S. society is based on property rights (Ladson-Billings & Tate, 1995). These property rights are operationalized in part by practices of racial commodification and racial essentialism and further advanced by practices of differential racialization. This facilitation of white-over-color ascendency is presented and treated as ordinary, serving an economic purpose (Delgado & Stefancic, 2012). We explicitly present these findings because, by seldom including mentions of race, STEM policy reports suggest that issues of access and underrepresentation in STEM are not being considered in light of racial disparities. As the old adage goes, out of sight, out of mind.

These findings are significant because the power dynamics of federal policy can be heavily influenced by these racialized social cues (Kelly, 2005) and as such have a powerful influence on what types of research are funded (or neglected). Funding influences the types of studies in which researchers engage. According to López (2003), in education research "policy not only determines what gets done but how decisions get done and by whom" (p. 74).

DISCUSSION AND RECOMMENDATIONS

STEM policy reports have taken on a color-blind, one-size-fits-all approach to access and representation, and as such funding may be disproportionately distributed to research which does not explicitly address racial disparities in access to STEM education (D. Martin, 2013; Omi & Winant, 1994). We find that a "sameness-as-fairness" approach to policy (K. D. Gutiérrez & Jaramillo, 2006) erases differences that matter to the teaching and learning of students from non-dominant communities.

As a diverse society we must interrogate these assumptions. Color-blind or science-for-all conceptions of equality can address only the most blatant forms of discrimination (e.g., mortgage redlining; Delgado & Stefancic, 2012). From the perspective of CRT, this is a moral and ethical imperative: As STEM education policy reports are delivered into the hands of the owners and operators of STEM enterprises and federal and state lawmakers, now, just as 50 years ago, race matters.

As the newest iteration of STEM education reform unfolds, it is vital for education policy report committees to actively work against the deficit writing already established and normalized by previous documents. We agree with Moses and Cobb (2001) and Tate (2001) that STEM education is a civil rights issue, one that must be addressed immediately. We call for

(a) an immediate increase in Students of Color in STEM education and careers regardless of their current or future potential to create economic benefits to the STEM enterprise;

(b) policy writers to recognize and make explicit in documents the racialized, lived experiences of the many and varied groups of Students of Color across the country to deconstruct the white-over-color ascendancy present in STEM education policy documents;

(c) beyond repairing the ways STEM education documents have perceived and presented Students of Color, documents to also explicitly, consistently, and uniformly call for race-conscious STEM education policies;

(d) STEM education policy documents to celebrate the unique and powerful voices and faces of the many varied communities present in our country, beyond the services those communities could provide to dominant society;

(e) policy report committees to increasingly include multiple members from many different Peoples of Color and communities of which they represent, particularly those with expertise in the specific issues Students of Color face in STEM education. To be clear on this point, simply including individuals of color on such committees does not guarantee a celebration of the unique and powerful voices of Students of Color (since ideology plays a critical role); nor should this task be left solely in the hands of individuals of color. Rather, it is of utmost importance that all members of such committees recognize and acknowledge the role race plays on students' academic trajectories and that these contexts are based on historical accounts with real effects;

(f) given the pervasiveness of racial essentialism throughout science education policy documents, policy makers to dedicate funding toward rigorous, community-based qualitative STEM education research focused on the within-group differences, and varied and differing STEM education resources and needs in the many and unique communities of color in our country.

Again borrowing from the words of Yasiin Bey, STEM education policy writers, as well as the owners and operators of the STEM enterprise, must see the faces, not just the lines and statistics, of the many different Peoples of Color in our country who have the humanitarian right to experience the wonder of a STEM education and the power of owning scientific knowledge.

APPENDIX

Description of Methods

Methods. We examined our research questions by collecting multiple pieces of information regarding instances of equity and race and ethnicity keywords within science education policy documents and the contexts underlying keywords. Our methodology is laid out into three main sections. First, we provide the criteria for including and excluding policy reports over the past two decades. Second, we present the equity, race, and ethnicity keywords that we used to infer how Students of Color are characterized in policy reports (Research Question 1). Third, we provide a description of the categories used to capture the context in which equity, race, and ethnicity keywords were used (Research Question 2).

Criteria for Including and Excluding Policy Reports. Our study examined science education policy reports that were published over the past 20 years. Policy reports had to

meet three criteria in order to be included in our analysis. Since we were interested in policy reports that served to inform U.S. government figures and policy makers, our first criterion was that reports had to be commissioned by a U.S. entity (e.g., the President or a U.S. government agency). Commissioned reports have a direct impact on decision-making policies in STEM and are likely to inform researchers' areas of study. For example, *Report to the President on the Use of Technology To Strengthen K–12 Education in the United States* was a report produced by the President's Committee of Advisors on Science and Technology (1997) to "provide independent advice to the President on matters related to the application of various technologies (and in particular, interaction computer- and network-based technologies) to K–12 education in the United States" (p. 6). Our second criterion was that policy reports had to *focus* on STEM education. That is, reports discussing education in general, and STEM education as one factor to consider in the larger K–12 and postsecondary systems were not included. We included only reports that focused on STEM education broadly, or a particular discipline within STEM in our sample (e.g., *Adding it up: Helping Children Learn Mathematics*, National Research Council, 2001). We included documents which focused on K–12 STEM education (National Research Council, 2009a; President's Committe of Advisors on Science and Teachnology, 1997) as well as those which focused on undergraduate STEM education (National Research Council, 1996, 2003a, 2003b; National Science Foundation, 1996). Our third criterion was that reports had to be published in the past 20 years. This criterion was set to examine relatively more recent discussions of access related to STEM education and limit our sample to a manageable size.

Identifying Equity Keywords. Once these criteria were met, we examined instances of these keywords to gauge how STEM policy reports commonly characterized Students of Color (Research Question 1). We used an iterative process to identify equity, race, and ethnicity keywords. During the first phase, we identified keywords in various STEM education policy documents related to access, equity, social justice, race, and ethnicity. This initial phase resulted in 22 keywords. During the second iterative phase, we searched all STEM policy reports for instances of words that were associated with Students of Color. This list served as a second independent list of keywords. Both lists (from Phases 1 and 2) were cross-referenced. Overlapping equity, race, and ethnicity keywords were included and ultimately composed the final keyword list. For example, *minority* was a commonly used keyword that was consistently identified across all policy reports, whereas *underprivileged* was not used at all, and thus removed from our list. In total, 12 keywords were identified (in alphabetical order): African American, Black, Ethnicity, equity, Hispanic, Latino, minority, Native, race, socioeconomic, underrepresented, and underserved. Any references made to these keywords were identified and tallied.

Conducting Keyword Searches and Tabulating. We shortened some keywords so a search would capture all possible variations of the word. Typically, this meant searching for the root word. For example, *minority* was shortened to *minorit* to capture all possible variations (e.g., minority and minorities). Next, we identified keywords within documents by using the software's "Find" or "Search" function tool. This process was conducted both in Microsoft Word, and independently, Adobe Acrobat to increase the accuracy of counts. Searches that resulted in keywords that did not relate to access, representation, or equity in STEM (our primary interest) were excluded from analysis. For example, a search for "Black" that contained a reference to black hole, a scientific phenomenon, was not included in our total counts.

We also limited searches to the main body of the documents. Document sections such as the preface, table of contents, footnotes, references, as well as addendums postceding the conclusions were not included. In some cases, we identified keywords in the footnotes, endnotes, or bibliographies referencing titles of other articles. These instances were not included in our study. In general, we included only keywords contained within the main body of the text in our analysis. We made these decisions to create a more equitable comparison across reports, as some reports used various forms of formatting. For example, some reports included bibliographies after each section, whereas others contained one bibliography and still others had none. Finally, we created a spreadsheet to record keyword instances across STEM policy reports.

Categorizing Keywords Contexts. Although identifying keyword instances provides an estimate of policy reports discussions of Students of Color in STEM, it does not provide the context that underlies the use of such keywords, which is the main purpose of our investigation. This section describes the process used to develop categories that were applied to examine the context in which equity, race, and ethnicity keywords were used.

Describing Context Categories. We allowed our context categories to organically emerge from policy reports. We searched for keywords within each policy report and highlighted the surrounding text. Surrounding text could include the sentence, paragraph, or page containing the keyword. The goal was to identify the context in which keywords were used. We imported keywords and their accompanying text into a spreadsheet. Next, we applied a preliminary code to each context description. During our second phase, we reviewed our preliminary codes and developed general categories that described similar content. Ultimately, two overarching categories were identified (see Table 3).

Our first category was *statements of the presence and problem of underrepresentation*. This category did not include any instances of justifications, analysis, or further discussions of underrepresentation; only statements of the existence of underrepresentation or that underrepresentation could be an issue of concern. Statements such as "Hispanic students, for example, appear to be singularly disadvantaged, attending schools with significantly fewer computers per student than average, particularly at the elementary school leve1" (President's Committe of Advisors on Science and Teachnology, 1997, p. 75) are common iterations of this category.

Our second broad category included all reasons offered to make changes to underrepresentation in STEM fields, which we applied a second tier of coding to this category and derived three subcategories. The most prevalent subcategory resulting from our coding was calling for changes in underrepresentation for the purpose of *economic benefit to the state.* This code indicates discussions surrounding keywords that positioned Students of Color as a resource commodity (i.e., commodification) available for use to benefit those who own or operate STEM. An example of this category from *Engineering in K–12 Education: Understanding the Status and Improving the Prospects* (National Research Council, 2009a) discusses the disparate representation of women and minority students in engineering fields.

The least common of our three subcategories, *STEM experience as a direct benefit to Students of Color*, occurred in one document and only one time. This category includes statements with a humanitarian view of Students of Color or promoted a STEM education for benefit of the betterment of the individual. This subcategory takes a humanistic perspective and explicitly promotes STEM education and experiences for the benefit of enjoyment, personal relevance, personal reward, and continued interest/inquiry to extend these experiences.

TABLE 3
Description of Categories Used to Examine Keyword Contexts

Overarching Category	Description	
1.Statements of the presence and problem of underrepresentation	Statements in which keywords are used to refer to underrepresentation, and thus, underrepresented students, as a problem to be fixed (e.g., use of descriptive statistics to highlight achievement gap between racial and ethnic groups)	
2. Reasons for change underrepresentation in STEM	(a) Economic benefit to state	Access to—and representation in—STEM should be increased in order for the US to remain a global economic competitor
	(b) Diverse perspective as a benefit to STEM enterprise	Individuals from different racial and ethnic groups bring to STEM various perspectives that strengthen STEM
	(c) STEM experience as a direct benefit to Students of Color	All individuals deserve to experience the joy of learning STEM and benefit from the knowledge and skills, especially groups that have been traditionally excluded

CRT and Analysis of Keywords. We selected CRT as an analytic framework for its affordances to dissect and reveal dominant views and practices which otherwise remain invisible, or ordinary. While CRT has multiple iterations in various disciplines, we found several of its central tenets to effectively describe the trends in our results. As such, we identified and labeled the presence of essentialism, differential racialization, and commodification in our results. Once labeled, we were then able to further and more richly analyze our results in broader social contexts.

In sum, the goals of our study were to examine how Students of Color are characterized in STEM policy reports and apply CRT to analyze what these characterizations reveal about the dominant views of and implications for Students of Color in STEM policy reports. We investigated these goals using an iterative coding process used to identify equity, race, and ethnicity keywords and a semigrounded approach to develop categories that described the contexts in which keywords were used.

REFERENCES

Alexander, M. (2012). The new Jim Crow: Mass incarceration in the age of colorblindness. New York: The New Press.

Barton, A. (1998). Reframing "science for all" through the politics of poverty. Educational Policy, 12(5), 525–541.

Basile, V., & Murray, K. (in press). Uncovering the need for diversity among K–12 STEM educators. Teacher Education and Practice.

Bell, D. A. (1980). Brown v. Board of Education and the interest-convergence dilemma. Harvard Law Review, 93(3), 518–533.

Bell, D. A. (1992). Faces at the bottom of the well: The permanence of racism. New York: Basic Books.
Bell, D. A. (2004). Silent covenants: Brown v. Board of Education and the unfulfilled hopes for racial reform. New York: Oxford University Press.
Bell, D. A. (2005). Unintended lessons in Brown v. Board of Education. New York Law School Law Review, 49, 1053–1067.
Bonilla-Silva, E. (1997). Rethinking racism: Toward a structural interpretation. American Sociological Review, 62(3), 465–480.
Bonilla-Silva, E. (2005). "Racism" and "new racism": The contours of racial dynamics in contemporary America. In Z. Leonardo (Ed.), Critical pedagogy and race (pp. 1–36). Malden, MA: Blackwell.
Bridges, K. M. (2002). On the commodification of the black female body: The critical implications of the alienability of fetal tissue. Columbia Law Review, 102(1), 123–167.
Business Roundtable. (2005). Tapping America's potential: The education for innovation initiative. Washington, D C: Author.
Cavalluzzo, K. S., Cavalluzzo, L. C., & Wolken, J. D. (2002). Small business loan turndowns, personal wealth and discrimination. Journal of Business, 75(4), 641–679.
Clinton, W. J., & Gore Jr., A. (1994). Science in the national interest. Washington, DC: U.S. Government Printing Office. Retrieved June 20, 2013, from http://clinton1.nara.gov/White_House/EOP/OSTP/Science/html/Sitni_Home.html
Crenshaw, K. (1991). Mapping the margins: Intersectionality, identity politics, and violence against women of color. Stanford Law Review, 43(6), 1241–1299.
Crenshaw, K. (2011). Twenty years of critical race theory: Looking back to move forward. Connecticut Law Review, 43(5), 1253–1352.
Crenshaw, K., Gotanda, N., Peller, G., & Thomas, K. (1995). Foreword. In K. Crenshaw, N. Gotanda, G. Peller, & K. Thomas (Eds.), Critical race theory: The key writings that formed the movement (pp. xi–xxxii). New York: The New Press.
DeCuir, J. T., & Dixson, A. D. (2004). "So when it comes out, they aren't that surprised that it is there": Using critical race theory as a tool of analysis of race and racism in education. Educational Researcher, 33(5), 26–31.
Delgado, R. (1990). When a story is just a story: Does voice really matter? Virginia Law Review, 76(1), 95–111.
Delgado, R. (2000). Derrick Bell's toolkit-fit to dismantle that Famous House? New York University Law Review, 75(2), 283–307.
Delgado, R. (2001). Explaining the rise and fall of African American fortunes—Interest convergence and civil rights Gains. Harvard Civil Rights-Civil Liberties Law Review, 37, 369–387.
Delgado, R. (2011). Rodrigo's reconsideration: Intersectionality and the future of critical race theory. Iowa Law Review, 96, 1247–1288.
Delgado, R., & Stefancic, J. (2001). Critical race theory: An introduction. New York: New York University Press.
Delgado, R., & Stefancic, J. (2012). Introduction. In Critical race theory: An introduction (2nd ed., pp. 1–6). New York: New York University Press.
Du Bois, W. E. B. (1903). The souls of Black folks. New York: Tribeca Books.
Eisenhart, M. A. (2011). "We can't get there from here:" The meaning and context of girls' engagement with STEM. Invited Inaugural Address. AERA Division G Advances in Social Contexts of Education Interdisciplinary Research Lecture. American Educational Research Association, New Orleans, LA.
Ennis, S. R., Ríos-Vargas, M., & Albert, N. G. (2011). The Hispanic population: 2010 (pp. 1–16). Retrieved June 20, 2013, from www.census.gov/prod/cen2010/briefs/c2010br-04.pdf.
Gardner, D. P., Larsen, Y. W., & Baker, W. (1983). A nation at risk: The imperative for educational reform. Washington, DC: U.S. Government Printing Office.
Gotanda, N. (1991). A critique of "our constitution is color-blind." Stanford Law Review, 44(1), 1.
Gutstein, E. (2009). The politics of mathematics education in the US: Dominant and counter agendas. In B. Greer, S. Mukhopadhyay, A. Powell, & S. Nelson-Barber (Eds.), Culturally Responsive Mathematics Education (pp. 137–164). New York: Routledge.
Guthman, J. (2008). "If they only knew": Color blindness and universalism in California alternative food institutions. The Professional Geographer, 60(3), 387–397.
Gutiérrez, K. D., & Jaramillo, N. E. (2006). Looking for educational equity: The consequences of relying on Brown. Yearbook of the National Society for the Study of Education, 105(2), 173–189.
Gutiérrez, K. D., & Rogoff, B. (2003). Cultural ways of learning: Individual traits or repertoires of practice cultural styles: A way of talking about. Educational Researcher, 32(5), 19–25.
Gutiérrez, R. (2008). A "gap-gazing" fetish in mathematics education? Problematizing research on the achievement gap. Reston, VA: The National Council of Teachers of Mathematics.
Gutiérrez, R. (2010). The sociopolitical turn in mathematics education. Journal for Research in Mathematics Education, 44(1), 37–68.

Gutstein, E. (2009). The politics of mathematics education in the US: Dominant and counter agendas. In B. Greer, S. Mukhopadyay, A. Powell, & S. Nelson-Barber (Eds.), Culturally responsive mathematics education (pp. 137–164). New York: Routledge.

Gutstein, E. (2010). The common core state standards initiative: A critical response. Journal of Urban Mathematics Education, 3(1), 9–18.

Harris, C. (1995a). Whiteness as property. Harvard Law Review, 106(8), 1710–1791.

Harris, C. (1995b). Whiteness as property. In K. Crenshaw, N. Gotanda, G. Peller, & K. Thomas (Eds.), Critical race theory: The key writings that formed the movement (Vol. 1101, pp. 276–291). New York: The New Press.

Hayes-Bautista, D. E., & Chapa, J. (1987). Latino terminology: Conceptual bases for standardized terminology. American Journal of Public Health, 77(1), 61–68.

Hurtado, S., Eagan, K., & Chang, M. (2010). Degrees of success: Bachelor's degree completion rates among initial STEM majors. Los Angeles: Higher Education Research Institute. Retrieved August 15, 2013, from http://www.heri.ucla.edu/nih/downloads /2010 - Hurtado, Eagan, Chang - Degrees of Success.pdf.

Jain, D., Herrera, A., Bernal, S., & Solórzano, D. G. (2011). Critical race theory and the transfer function: Introducing a transfer receptive culture. Community College Journal of Research and Practice, 35(3), 252–266.

Kelly, G. (2005). Discourse, description, and science education. In R. K. Yerrick & W.-M. Roth (Eds.), Establishing scientific classroom discourse communities: Multiple voices of teaching and learning research (pp. 79–104). Mahwah, NJ: Erlbaum.

Kohli, R., & Solórzano, D. G. (2012). Race ethnicity and education teachers, please learn our names!: racial microaggressions and the K–12 classroom. Race Ethnicity and Education, 15(4), 37–41.

Ladson-Billings, G. (1998). Just what is critical race theory and what's it doing in a nice field like education? International Journal of Qualitative Studies in Education, 11(1), 7–24.

Ladson-Billings, G. (2005). The evolving role of critical race theory in educational scholarship. Race Ethnicity and Education, 8(1), 115–119.

Ladson-Billings, G. (2012). Through a glass darkly: The persistence of race in education research and scholarship. Educational Researcher, 41, 115–120.

Ladson-Billings, G., & Tate, W. (1995). Toward a critical race theory of education. Teachers College Record, 97(1), 47–68.

Lappan, G., & Wanko, J. (2003). The changing roles and priorities of the federal government in mathematics education in the United States. In G. Stanic & J. Kilpatrick (Eds.), A history of school mathematics (Vol. 2, pp. 897–930). Reston, VA: National Council of Teachers of Mathematics.

Lee, O., & Buxton, C. A. (2010). Diversity and equity in science education: Research, policy, and practice. Multicultural Education Series. New York: Teachers College Press.

Leonard, J., & Evans, B. R. (2008). Math links: Building learning communities in urban settings. Journal of Urban Mathematics Education, 1(1), 60–83.

Leonard, J., Napp, C., & Adeleke, S. (2009). The complexities of culturally relevant pedagogy: A case study of two secondary mathematics teachers and their ESOL students. High School Journal, 93(1), 3–22.

Leonardo, Z. (2002). The souls of White folk: Critical pedagogy, Whiteness studies, and globalization discourse. Race Ethnicity and Education, 5(1), 29–50.

Leonardo, Z. (2004). The color of supremacy: Beyond the discourse of "White privilege." Educational Philosophy and Theory, 36(2), 137–152.

Leonardo, Z. (2011). After the glow: Race ambivalence and other educational prognoses. Educational Philosophy and Theory, 43(6), 675–698.

Leonardo, Z. (2012). The race for class: Reflections on a critical race class theory of education. Educational Studies: A Journal of the American Educational Studies Association, 48(5), 427–449.

Leonardo, Z. (2013). The story of schooling: critical race theory and the educational racial contract. Discourse: Studies in the Cultural Politics of Education, 34(4), 599–610.

Levine, L. (2011). Offshoring (or offshore outsourcing) and job loss among U S. workers. Washington, DC: Congressional Research Service.

López, G. R. (2003). The (racially neutral) politics of education: A critical race theory perspective. Educational Administration Quarterly, 39(1), 68–94.

Martin, B. (1991). From Negro to Black to African: The power of names and naming. Political Science Quarterly, 106(1), 83–107.

Martin, D. (2003). Hidden assumptions and unaddressed questions in mathematics for all rhetoric. The Mathematics Educator, 13(2), 7–21.

Martin, D. (2006). Mathematical thinking and learning mathematics learning and participation as racialized forms of experience: African American parents speak on the struggle for mathematics literacy. Mathematical Thinking and Learning, 8(3), 197–229.

Martin, D. (2009a). Liberating the production of knowledge about African American children and mathematics. In D. B. Martin (Ed.), Mathematics teaching, learning, and liberation in the lives of Black children (pp. 3–36). New York: Routledge.

Martin, D. (2009b). Researching race in mathematics education. Teachers College Record, 111(2), 295–338.

Martin, D. (2013). Race, racial projects, and mathematics education. Journal for Research in Mathematics Education, 44(1), 316–333.

Martin, D., Gholson, M. L., & Leonard, J. (2010). Privilege in the production of knowledge. Journal of Urban Mathematics Education, 3(2), 12–24.

Moses, R., & Cobb, C. (2001). Radical equations: Civil rights from Mississippi to the Algebra Project. Boston: Beacon Press.

Muhammed, K. (2010). The condemnation of Blackness: Race, crime, and the making of modern urban America. Cambridge, MA: Harvard University Press.

Mutegi, J. W. (2011). The inadequacies of "science for all" and the necessity and nature of a socially transformative curriculum approach for African American science education. Journal of Research in Science Teaching, 48(3), 301–316.

National Commission on Mathematics and Science Teaching for the 21st Century. (2000). Before it's too late: A report to the nation from the National Commission on Mathematics and Science Teaching for the 21st century. Washington, DC: Author.

National Defense Education Act, P.L. 85-864; 72 Stat. § 341 (1958).

National Governors Association. (2007). Innovation America: Building a science, technology, engineering and math agenda. Washington, DC: Author.

National Mathematics Advisory Panel. (2008). Foundations for success: The final report of the National Mathematics Advisory Panel. Washington, DC: U.S. Department of Education.

National Research Council. (1996). From analysis to action: Undergraduate education in science, mathematics, engineering, and technology. Washington, DC: The National Academies Press.

National Research Council. (2001). Adding it up: Helping children learn mathematics. Washington, DC: The National Academies Press.

National Research Council. (2003a). BIO2010: Transforming undergraduate education for future research biologists. Washington, DC: The National Academies Press.

National Research Council. (2003b). Evaluating and improving undergraduate teaching in science, technology, engineering, and mathematics. Washington, DC: The National Academies Press.

National Research Council. (2005). Educating the engineer of 2020: Adapting engineering education to the new century. Washington, DC: The National Academies Press.

National Research Council. (2007a). Rising above the gathering storm: Energizing and employing America for a brighter economic future. Washington, DC: The National Academies Press.

National Research Council. (2007b). Taking science to school: Learning and teaching science in grades K–8. Washington, DC: The National Academies Press.

National Research Council. (2009a). Engineering in K–12 education: Understanding the status and improving the prospects. Washington, DC: The National Academies Press.

National Research Council. (2009b). Learning science in informal environments: People, places, and pursuits. Washington, DC: The National Academies Press.

National Science Foundation. (1996). Shaping the future: New expectations for undergraduate education in science, mathematics, engineering, and technology (nsf96139). Arlington, VA: Author.

National Science Foundation. (2013). Women, minorities, and persons with disabilities in science and engineering. Special Report NSF 13-304. Arlington, VA: Author. Retrieved November 15, 2013, from www.nsf.gov/statistics/wmpd.

NGSS Lead States. (2013). Next generation science standards: For states, by states. Washington, DC.

Omi, M., & Winant, H. (1994). Racial formation in the United States: From the 1960s to the 1990s (2nd ed.). New York: Routledge.

Parsons, E. R. C., Rhodes, B., & Brown, C. (2011). Unpacking the CRT in negotiating White science. Cultural Studies of Science Education, 6(4), 951–960.

Pinderhughes, E. (1989). Understanding race, ethnicity, and power: The key to efficacy in clinical practice. New York: The Free Press.

President's Committee of Advisors on Science and Technology. (1997). Report to the President on the Use of Technology to Strengthen K–12 Education in the United States. Washington, DC: Executive Office of the President.

President's Council of Advisors on Science and Technology. (2010). Prepare and Inspire: K–12 Education in Science, Technology, Engineering, and Math (STEM) for America's Future: Executive Report. Executive Office of the President, President's Council of Advisors on Science and Technology.

Rios, V. M. (2011). Punished: Policing the lives of Black and Latino boys. New York: NYU Press.
Rosebery, A. S., Ogonowski, M., DiSchino, M., & Warren, B. (2010). "The coat traps all your body heat": Heterogeneity as fundamental to learning. Journal of the Learning Sciences, 19(3), 322–357.
Samuelson, R. J. (2005, May 26). Sputnik scare, updated. The Washington Post. Retrieved November 15, 2013, from http://www.washingtonpost.com/wp-dyn/content/article/2005/05/25/AR2005052501812.html.
Schweingruber, H., Quinn, H., Keller, T., & Pearson, G. (2013). A framework for K–12 science education looking toward the future of science education. The Bridge, 43(1), 43–50.
Slocum, R. (2010). Race in the study of food. Progress in Human Geography, 35(3), 303–327.
Solórzano, D. G., & Ornelas, A. (2002). A critical race analysis of advanced placement classes: A case of educational inequality. Journal of Latinos and Education, 1(4), 215–229.
Solórzano, D. G., & Yosso, T. J. (2001). Critical race and LatCrit theory and method: Counter-storytelling. International Journal of Qualitative Studies in Education, 14(4), 471–495.
Spillane, J. P. (2008). Policy, politics, and the National Mathematics Advisory Panel Report: Topology, functions, and limits. Educational Researcher, 37(9), 638–644.
Stinson, D. W. (2008). Negotiating sociocultural discourses: The counter-storytelling of academically (and mathematically) successful African American male students. American Educational Research Journal, 45(4), 975–1010.
Tate, W. (1994). Mathematics standards and urban education: Is this the road to recovery? The Educational Forum, 58(4), 380–390.
Tate, W. (1997a). Brown, Sputnik, and mathematics reform: Lessons from the past. Readings on Equal Education, 14, 251–264.
Tate, W. (1997b). Critical race theory and education: History, theory, and implications. Review of Research in Education, 22, 195–247.
Tate, W. (2001). Science education as a civil right: Urban schools and opportunity-to-learn considerations. Journal of Research in Science Teaching, 38(9), 1015–1028.
U.S. Bureau of Indian Affairs. (2014). 2013 American Indian Population and Labor Force Report. Washington, DC: U.S. Department of the Interior.
U.S. Census Bureau. (2012). U.S. Census Bureau projections show a slower growing, older, more diverse nation a half century from now. Retrieved August 15, 2013, from www.census.gov/newsroom/releases/archives/population/cb12-243.html.
U.S. Census Bureau. (2013). International migration is projected to become primary driver of U.S. population growth for first time in nearly two centuries. Retrieved August 15, 2013, from www.census.gov/newsroom/press-releases/2013/cb13-89.html.
U.S. Department of Education. (2007). Report of the Academic Competitiveness Council. Washington, DC: Author.
Vaught, S. E. (2008). The color of money: School funding and the commodification of Black children. Urban Education, 44(5), 545–570.
Williams, A. D. (2009). The critical cultural cypher: Remaking Paulo Freire's cultural circles using hip hop culture. International Journal of Critical Pedagogy, 2(1), 1–29
Wilson, W. (1997). When work disappears: The world of the new urban poor. New York: Alfred A. Knopf.
Woodson, C. G. (1933). The mis-education of the Negro. Washington, DC: The Associated Publishers.
Yosso, T. J. (2005). Whose culture has capital? A critical race theory discussion of community cultural wealth. Race Ethnicity and Education, 8(1), 69–91.
Yosso, T. J., & Ravine, C. (2007). "This is no slum!": A critical race theory analysis of community cultural wealth in culture clash's Chavez ravine. Aztlán: A Journal of Chicano Studies, 32(1), 145–180.
Yosso, T. J., Smith, W. A., Ceja, M., & Solórzano, D. G. (2009). Critical race theory, racial microaggressions, and campus racial climate for Latina/o undergraduates. Harvard Educational Review, 79(4), 659–786.