

Droppin' Science and Dropping Science: African American Males and Urban Science Education

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This paper explores components of urban science education that are underemphasized in contemporary research in the field of study and widely considered necessary for improving the experiences of African-American males in science. It explores the current state of urban science education through critical reflection from the standpoint of an African-American male student and teacher and calls for the use of appropriate theoretical frameworks for constructing meaning of the African American male experience in urban schools. Finally, through a broad description of a research study in urban science classrooms, the paper provides insight into future research that considers the frameworks prescribed and described in the paper.

I vividly remember sitting in a biology class in what was described as a “specialized urban public school” and feeling invisible. I did not see myself as a part of the classroom, and was not able to involve myself in the lessons that were taught. This was the case not because of any specific things that the teacher said or did or because I was not interested in science. It was not because I was afraid of “acting White” or because I felt like I had an image as a poor student that had to be upheld. Rather, it was because I felt that in this particular class, it did not matter to the teacher or the rest of the class whether I was there or not. There was nothing that made me feel like who I was, the intelligence I had, or the specific things that made me feel gifted outside of the classroom mattered in the science classroom.

At the end of each class, as I walked away from the science class and into the lunchroom, I slowly became visible again. I would gather with a few friends around a lunchroom table, listen to complex drum patterns being created by fists and palms that interchangeably thumped and slapped on the table, and rap with my friends. In this small space, I had an audience, my voice was heard, my words mattered, and I could talk about everything from how my day went to even the small nuggets of information that I absorbed from the science class. In this space, I was droppin' science - a highly complex way of speaking in rhyme while discussing complex topics using metaphor and analogy. However, in the actual science class, I was not able to hold on substantially to anything the teacher was sharing -I was dropping science. The aforementioned process of droppin' science outside the science classroom and then dropping science within it, is a part of the experience of many African-American males in urban science classrooms.

In the work of many science education researchers, there is an ongoing misunderstanding of the experiences of African-American males in science, much like that which was described above, and a misplaced focus on symptoms of their non-achievement, such as a lack of motivation and participation in science (Kahle, Meece, & Scantlebury, 2000; Seiler, 2001).

After exhibiting a lack of motivation and participation in my first year of high school biology, I was advised by the teacher to meet with a high school counselor. He wanted to know why I was not doing well in science, and seemed to be puzzled about my poor grades in the subject despite the fact that I 'seem[ed] like a smart kid'. He mentioned a conversation we had earlier in the school year where I mentioned that science was my favorite subject, and I could not understand why I was doing poorly in the class. Unfortunately, at that time, I could not find the words to let him know that the science classes made me feel invisible.

Like my high school counselor, many scholars who focus on African-American males in urban science education undertake their research from the vantage point of being concerned, alarmed or perplexed by the achievement gaps between these students and their counterparts from other ethnic backgrounds and less diverse social settings (Lee & Luykx, 2004; Norman, Ault, Bentz, & Meskimen, 2001). In most cases, the researcher is exploring various possible means of addressing one of the many issues related to this population's *seemingly* perpetual non-achievement in the sciences. In accomplishing these goals, the unique vantage point of the African-American male is often absent from these researchers' undertaking.

In urban science education research, the interrelationships between gender and race or ethnicity in the teaching and learning of science remain grossly under-explored (Stanley & Brickhouse, 1994; Castambis, 1995) and can be truly comprehended only by understanding the experiences of African-American males and the extent to which they exhibit attributes that are integral to scientific thinking, including such characteristics as open-mindedness and inquisitiveness (American Association for the Advancement of Science, 1993), both inside and outside the classroom.

In response to the absence of a focus on the experiences of African-American male students in science education classes, this paper necessarily focuses on their standpoint in the urban science classroom as a point of departure for investigative study. In order to engage in this type of investigation and consider this standpoint in a way that holds true to the worldview of the African-American male, I employ the reflection/recollection of prior experiences similar to those which introduce this work, discuss the experiences of the African-American male in urban science education from my position as a part of that population, and then transition into a description of a research project conducted with this population.

While the African-American male experience either within or outside of the urban science classroom is not monolithic, my background as part of this population stands as a piece of the collective experience of African-American males and as an exemplar of the sense-making that individuals in this population undergo in their experiences with science and science education. Therefore, I present this work as other authors on this topic should, but have not previously done: as an expert on nothing but my own experiences, and a witness to the collective oppression within urban science classrooms of African-American males in urban science education. In this effort, I provide a robust outline of a theoretical framework not only as an entry into further study but also as a set of outcomes that arises from merging my experiences in urban science classrooms and my theoretical explorations of how culture is enacted within these settings.

An acknowledgment of the larger issues surrounding race, ethnicity, and science, and a consideration of the consequent affiliation of urban youth to each other (oftentimes under the premise of a purposeful disregard of school science) are an integral part of addressing the specific academic needs of African-American males. This process requires re-examining the importance of teaching science with an explicit focus on cultural relevance, inquiry, and student interest (Lemke, 2001). The process also requires an understanding that urban science education for African-American males has become a field of study whose chief endeavor runs counter to what the goals are for science education –that is, the engagement of all students in the classroom.

Theoretical framework

This study is rooted in a framework that explores the concepts of culture, ritual, and identity as they relate to the experiences of African-American students in urban science classrooms. This framework is employed to make sense of the misalignments that exist between African-American males and urban science education. In this work, I primarily focus on the term *social capital*, as articulated by sociologists including Bourdieu (1986) and Coleman (1988) as the chief means of understanding the African-American male experience in science classrooms. I find that this construct (within a larger sociocultural framework) lends itself to the experiences of the African-American male because it considers dimensions of social interaction that are absent from traditional studies of urban science classrooms. Social capital is viewed as the amassed benefits of social relationships when individuals interact (Portes, 1998). This concept posits itself comfortably in the study of African Americans in urban settings. Largely, this is due to the complex nature of Black culture (schema and practices) and the fact that the ‘urban’ culture adopted by many African-American students is not valued in schools.

Culture, Capital and Social Networks

The practices of African-American males in science classrooms often involve engagement with each other to either deflect societal oppression or absorb strength from each other to overcome it. These practices are enacted in ways that may be either self-glorifying or self-deprecating and are enacted in response to a societal oppression that manifests itself in the classroom in the form of the reinforcement of negative stereotypes about their academic abilities. Oppression is not always a visibly painful process that exists exclusively beyond the scope of the classroom and produces only visceral reactions. As such, I assert that oppression is any act or process that either limits or extracts one from a position of power or acceptance. Therefore, any process in the urban science classroom that inhibits the student from fully engaging in science or that alienates him from academic success in school is oppressive. Furthermore, I suggest that the behaviors that African-American males enact and the dynamics of the relationships in which they engage be viewed as reactions to the oppression that they experience within schools.

As noted earlier, the most common reaction to oppression manifested by African-American males is the formation of strong ties that fellow participants in a culture typically share with one another. These connections are an example of what Coleman (1998) refers to as dense networks. These dense networks engender an alienation from structures (such as people, subjects, and institutions) that students believe are separate from them or complicit in their oppression while simultaneously fostering a deep affiliation between African-American male students (Emdin, 2010b).

In Coleman's (1988) description of dense networks, he discusses the ways that a shared currency of social capital amongst a population creates dense networks where trust is growing, group needs and concerns are being met, and outsiders find it challenging to enter the networks. Extending this focus on social networks that are developed from social capital, I draw from the work of Burt (2001) who discusses ways to enter dense networks of which one is not a member. Burt argues that dense social networks can be entered through the creation of "structural holes" that can help to extend existent social networks through the creation of weak ties to outsiders. This framework, which takes into account social capital, dense networks, and the possibilities for structural holes that can allow one to enter into a dense network, elucidates the conundrum that faces science teachers of African-American males in urban classrooms. The framework makes it clear that the teacher is an outsider to student networks and must place their greatest emphasis teaching methods that have the potential to serve as structural holes in existent student networks. It also provides a theoretical explanation for the importance of truly culturally relevant curricula for African-American males that can possibly serve as structural holes and weak ties to their culture.

More specifically, this framework explains my experiences as a teacher of African-American males, one who assumed that by virtue of being from the same racial background as my students, I would be afforded automatic ties to them that would benefit my teaching and their learning. It also explains my eventual realization that there are no automatic connections and that instruction must focus on creating weak ties (possibly via relevant curriculum) to students.

Cultures and Subcultures: False Perceptions of African-American males

The sociocultural framework outlined above assumes that the nature of urban science education and the lives of African-American males each have their own distinct cultures that are not necessarily aligned but instead are forced to coexist when they collide in urban science classrooms. Culture here refers to an individual or group's schematic understandings as well as their practices (Bourdieu, 1993). Using Bourdieu's articulation of culture as a base, I focus on Becker's (1963) outline of the relationship of cultures to subcultures and the ways that practices enacted by a group develop into integral pieces of their culture. In particular, Becker focuses on the culture of youth that are perceived as deviant and how their cultural understandings can be considered as both subcultures and responses to the rules and regulations of the larger culture or society in which they are embedded. In other words, the subculture of deviant youth is a response to the larger culture of society. Using Bourdieu and Becker as a base, I consider the relationship between culture and subculture as being mediated by the practices performed by people who either enact oppression or are forced to respond to it. In this case, if urban science teachers enact practices that are oppressive to African-American males, the teacher is fostering a subculture among students that stands in opposition to the classroom and causes the students to not see themselves as being represented within that social space. For example, the urban science teacher's expectation that the African-American male students will be docile and engage in rote practices within the science classroom causes a student who refuses to engage in these practices to be viewed as an outsider to the culture of urban science education. In response, the student who refuses to be docile "may not accept the rule by which he is being judged and may not regard those who judge him as either competent or legitimately entitled to do so" (Becker, 1963, p. 2). Consequently, the student may feel invisible within the classroom and enact cultural

practices that subvert the teacher and his or her goals simply for the purpose of the student's feeling present in the classroom.

Becker's work on deviance provides insight into the science class experiences of African-American males in contemporary urban science classrooms because their reactions to feeling invisible in classrooms is often viewed by teachers as deviant behavior (Losen & Orfield, 2002; Coutinho et al, 2002). Furthermore, deviance "has strong connections with feelings of youthful rebelliousness" (Becker 1963, p. 175), which plays out as the disinterest in education oftentimes associated with African-American males. This rebelliousness is a large component of both historical and contemporary descriptions of youth of color in general (Cross, 2003; Zeldin, 2002), and has become an identity marker for African-American males. This notion of a rebellious identity sustains some educators' justification for a hyper-focus on behavior management and discipline in lieu of trying to truly engage youth in science.

Core and Role African-American Male Identity

Turner and Stets (2006) consider identity to be the view of self that pushes individuals to behave in certain ways in their interactions with others. Turner (2002) also argues that individuals have multiple identities that include both core and role identities. Core identities are relatively stagnant and reflect a true self, whereas role identities are expressions of self that vary across contexts and depend on the scenarios that a person encounters.

In classrooms where African-American males students' forms of capital are devalued, or where their culture is misaligned with that of the teacher and the ways that the academic discipline are presented, certain non-school identities are expressed. In these scenarios, behaviors or identity markers that reflect the role of a disinterested student are enacted. This argument falls in line with research in science education that shows that identity conflicts exist among youth of color when they attempt to form new identities as science learners (Brown, 2004, Buxton, 2005). In summary, African-American males encounter challenges in resolving differences between their core identities, which reflect an interest in school and science, and the identities as members of a particular culture.

Moving from Dropping Science into Droppin' science

When African-American males are outside of the science classroom and in social spaces that align with their core identities, their desires to think critically, make keen observations, support these observations with facts, and engage in dialogue are activated. These characteristics are most evident in spaces where they are rapping with peers and "droppin' science. The art of "droppin' science" involves processes such as discussing, describing, predicting, and analyzing a number of situations and then describing them in words through rhyme (Emdin, 2010a). This ability to discuss, describe, predict, and analyze aligns with the skills necessary to actively engage in science lessons (Germann, Haskin, & Auls, 1996). Unfortunately, these attributes are rarely expressed within urban science classrooms, despite their potential for supporting science learning. This is the case because attempts to exhibit these behaviors within classrooms are misconstrued as deviant when they are actually exhibitions of interest. Instead, the urban classroom focuses on the dissemination of science facts and the creation of classroom spaces that quell possibilities of behavior problems in lieu of truly engaging students in science. As a high school science teacher, I was put in the position to enact these practices and trained to do so

despite the fact that as a student, these practices disengaged me from science. Unfortunately, “when an area of intellectual activity is tagged with the label ‘science’ people who are not scientists (or perceived as scientists) are de facto barred from having any say about its substance” (Jasanoff, 1991, p. 14) and in the case of African-American youth in urban schools, not having a *say* in science within classrooms is the underlying cause of their feelings of invisibility and their subsequent disinterest.

Methods

The methods in this paper are a combination of traditional research methods, such as interviews and field-notes, critical reflection, and the description of a research study. Critical reflection involves a process of revisiting and questioning prior experiences, reinforcing or disrupting established frames of reference, or creating new meanings out of prior experiences (Brookfield, 1987, Mezirow, 1990). As a result of electing this approach, I revisit the spaces where many of my experiences with urban science education occurred, and, as I have done at certain junctures up until this point in the paper, I utilize my personal reflections on these experiences as a vehicle to make sense of the experiences of African-American students in the contemporary urban science classroom.

The use of one’s own experience as a source of data has been called everything from narcissistic to non-academic (Coffey, 1999; Denzin & Lincoln, 1994; Sparkes, 2000). However, when uncovering a voice that has been silenced, any insight into the experiences of those who have had the potential to connect to the discipline, but have not, is necessary.

Situating the Research

I began the research component of this work by expanding on the themes of culture, ritual, and identity discussed earlier. In moving beyond my theoretical explorations and my practical applications of them, I began my research by recanting my previous experiences. Earlier, I had touched upon these issues by writing about them, sifting through journals that I had written over the course of my experiences as student, science teacher and science education researcher. I revisited and engaged myself with artefacts, such as my student notes and written questions on the ways my cultural identity as an African-American male were either supported or challenged in my experiences in urban science classrooms. I engaged in a process of identifying the culture I most closely identified with, as I still do today as an African-American participant in hip-hop culture. I then outlined the specific rituals I engaged in on a regular basis both within and outside of the urban science classroom.

While my experiences provided some insight into the African-American male students’ experience in science education, in order to gain a more contemporary analysis, and not rest exclusively on my own experiences, I conducted a research project that focused on the present practices and rituals of African-American male students. In this process, there were two major means of collecting data.

Video Taped Recordings (VTR)

The primary method of data collection, other than my reflections, were videotaped recordings (VTR) of science classrooms and conversations about classrooms that occurred in

interviews and structured dialogues. Using VTR allowed for indepth study of the approaches to teaching and learning implemented within the classroom and allowed for a pinpointing of instructional practices that directly affected African-American male students in science.

The use of VTR in conjunction with field notes is a valuable approach for studying and interpreting behavior and monitoring “all interactionally relevant cues in sustained exchanges or in conversations involving multiple participants” (Grimshaw, 1982, p. 123). This process allows for a reviewing of events in multiple ways, or, as Morse (1994) describes the process, it allows for real time, slow motion, frame by frame, and forwards and backwards analysis. This research approach is the ideal compliment to critical ethnography because it fills in the gaps in recanted experience with contemporary descriptions of similar situations. Furthermore, when combined with additional research tools that function to question and unravel the present, this approach allows for even more thorough investigations of experienced phenomena.

Cogenerative Dialogues/Cyphers

A second data collection method used in this study was cogenerative dialogues/cyphers. These are dialogues with students and teachers outside of the classroom that allowed for in-depth discussions about African-American male student experiences within the classroom. Cogenerative dialogues are conversations that involve 4-6 students, wherein the teacher is having a discussion about the class in a way that allows for equal turns at talk, mutual respect of all participants, and development of a plan of action for improving the class that all participants in the conversation can implement (Tobin & Roth, 2005). These dialogues cover topics that range from specific topics being taught to the social dynamics in the classroom. The dialogues provide opportunities for students and teachers to investigate practices that they both enact in classrooms, practices that can be classified as rituals. They also provide opportunities for in-depth conversations about the practices that students are responding to as they enact the conversation; that is, the structures existing in the urban science classroom. Rather than name this process as cogenerative dialogues, as it is identified in science education research, I refer to them, in my orienting of the African-American males that were selected to participate in this research study, as *cyphers*. This term is used because these students engage in a similar process of gathering, talking across differences, having equal turns at talk, and coming up with solutions to shared problems when they are droppin’ science in social spaces that they themselves call cyphers.

Context of the Study/Participants

The research component of this paper was conducted in an urban high school in a large city in the Northeastern United States. The student population in the school was 97% African American and Latino/a with a high population of students from low socioeconomic backgrounds. The demographics in this school mirror those in other urban schools across the city, and while I taught and reflected on my experiences with all students in the classroom, the cyphers I engaged in were with African-American males only.

Former Student and Physics Teacher

During the time that I conducted the research component of this paper, I was a five-year veteran teacher who had experience teaching mathematics and science in both middle and high schools in urban settings. I was in my mid-twenties, had an extensive background in the sciences, and was teaching a conceptual physics course that was intended to introduce students to science and encourage them to progress further in the discipline. From the first class I taught, I was immediately drawn to the unique ways that African-American males in the classroom engaged in science and with their peers. My connection to the practices these students enacted was rooted in the fact that they called forth my relatively recent past as an urban African-American male in science classrooms. More specifically, I identified with these students' distinct modes of talk, elaborate ways of greeting each other, and generally inquisitive nature.

Despite my connections to the African-American male students in the classroom, I wrestled with a serious tension between my ways of making sense of the world as an African-American male and teaching science in ways that I had learned to teach it and had seen it taught in times past. As a teacher, I often found myself listening to messages about the best ways to teach students of color that came from my peers and mentor teachers. I internalized adages like "Don't smile until June," and "Don't tell them anything about your personal life." Although I remember feeling like my previous science teachers (who obviously believed these sayings) did not connect to me because I viewed them as robots that spouted science facts simply to hear themselves talk, the nature of urban science teaching caused me to enact similar practices as my former science teachers and to alienate the African-American males in my classroom.

Data Sources and Analysis

Classroom Video Analysis

In order to fully understand the practices I enacted that were alienating students, the first wave of data analysis involved a reviewing of VTR of my classes and an identification of patterns in my practices that invited distinct responses from African-American male students. This step included a selection of short (30second to 2minute) video vignettes of the classroom video during which I spoke directly to African-American male students during my science lessons. After these practices were identified, I studied the circumstances surrounding their enactment. I would identify the structures in the classroom during the enactment of the rituals like time of day, what topic was being taught, and what students may have said or done to trigger the enactment of a specific practice. This step allowed for a thorough understanding of my practices, students' reactions to them, and possible reasons why each of them occurred.

After the initial video vignettes were captured and the particular practices that I enacted were identified, the science class VTR were observed and then discussed within cyphers with African-American male students to facilitate discussion of the dynamics at play within their classrooms and the implications of these dynamics on the students' connection to science.

VTR of classes that were studied in cyphers, were cut into short vignettes, and those that had similar themes were grouped by theme, date and occurrence. Over time, all classroom videotape recordings collected within an academic year were studied. Videorecorded conversations about this viewing as well as written descriptions based on studies of VTR vignettes were compiled. After studying the video vignettes and identifying my practices, I

analyzed each vignette for observations of African-American male student practices that occurred consistently in response to, or roughly simultaneous to, the enactment of my teacher rituals. From these vignettes, practices enacted by students were coded and described, and, when they occurred consistently over time, were identified as rituals.

Once the student rituals were identified, I was able to compare them to rituals that I had enacted as a student and to focus on the thought processes behind my own student rituals in order to make sense of the thinking of these students.

Findings

My Rituals as Physics Teacher

Studies of VTR from my classroom during the first few weeks of school indicated that I enacted many practices that engaged my African-American male students but did not occur consistently. At this point in the academic year, I was deeply attuned to my previous experiences in science classrooms and wanted to ensure that I would not replicate the negative experiences I had with my own science teachers as I instructed my current students. The practices enacted in the first weeks of school included having a demonstration to start off science lessons and assessing students' knowledge through non-conventional assessments such as oral presentations and portfolios. These oral presentations provided students with opportunities for droppin' science as they would outside of the science classroom as they were given the space to generate impromptu monologues about the science content I taught. However, as the academic year progressed and pressures to ensure that students were being well behaved and performing well on conventional assessments arose, I began to abandon practices that engaged my African-American students in favor of those that reflected strategies other science teachers had implemented.

After studying the VTR of the classroom activity and discussing them with my African-American male students, it became clear that while many of my practices captured their attention and supported their interest in science, the rituals that I enacted were not supportive of the science learning experiences of my students. In fact, the research indicated that the rituals I enacted inhibited students from actively participating in the class by limiting their cultural expressions in the classroom. For example, one ritual that I enacted on multiple occasions was that of answering my own questions when students did not immediately answer one that I posed. This ritual occurred most often when there was a new concept I wanted to introduce or when I was reviewing a lesson I had previously taught that I expected the students to understand. Students reported that this ritual alienated them and made it seem like I was teaching only for myself. They also reported that in response to this ritual, they purposefully did not answer questions I posed in class.

Another significant ritual that the VTR revealed was that I often curbed the students' scientific discussions before they reached a point where the questions would get to a more complex understanding of the topic. This was not the case with other students in the classroom but was almost always the case with the African-American male students. For example, when students began discussing an idea that was not the direct focus of the lesson, I would curb the discussion and tell them to stay focused on the topic at hand. As I observed this ritual being repeatedly enacted on VTR and reflected on it, I realized I was teaching students from a viewpoint of fear of the potential that their conversations would lead to poor behavior rather than

understanding that the conversations they were having had the potential to spark passion for the subject matter.

Another prominent ritual that was uncovered in VTR was that I would stop the lesson whenever African-American male students would talk, raise their voices, or say anything that I believed was not directly related to the science lesson. When enacting this ritual, I repeatedly stopped my lesson to make statements that indicated that I was disappointed with the students, and in the process, took time from teaching and also alienated students from the subject matter.

Rituals of the African-American Male Urban Science Student

When analyzing my past practices as a student in urban science classrooms and making sense of the rituals of African-American students in my classroom, it became clear that student rituals were direct responses to teacher rituals. Some of the student rituals included students falling asleep during the lesson, talking while the teacher taught, and refusing to complete classroom assignments. In many instances, these rituals translated into student practices outside of the classroom. For example, some students in each of the classrooms did not complete homework assignments and would turn away from the teacher or get upset when the teacher asked them for their homework. In other instances, they would not complete assigned tests or quizzes because they had not studied for these exams once they were outside of the science classroom.

Cogenerative Dialogues and the Urban Student: What the Cyphers Tell Us

Insight into the expression of certain parts of student identity, the nature of student rituals, and their forms of expression emerged from conversations in and out of the classroom cyphers. This was particularly the case with cyphers that were triggered by the presentation of classroom VTR. These cyphers (where students could watch the interactions between themselves and their science teacher) allowed African-American male students to provide profound insight on specific rituals with implications for improving their learning experiences. This eventually led to conversations about how they are purposefully “dropping science” in school and “droppin’ science” outside of it.

In cyphers, students made it clear that a majority of the practices they enacted that were disruptive to science lessons. The minimal effort they put forth into studying for science was their way of paying retribution to their teachers for the poor effort they were putting into making the science classes interesting. In other words, students were able to identify the specific rituals they had enacted and discuss which practices or rituals enacted by the teachers had elicited the most favorable response.

Discussion and Implications

Contrary to the goals of traditional papers in urban science education, the aims of this paper were not to present an empirical study or discuss finite outcomes to an investigation. Rather, they were to situate the state of urban science education for African-American males, present a bricolage of frameworks for investigating their experiences in science classrooms, and describe a study that considers this set of frameworks in making sense of the experiences of

African-American males in science. In meeting these goals, the intent of the article was to make a few points about urban science education for African-American males clear.

- 1) Teachers in urban science classrooms enact pedagogical practices that they believe are best for their African-American male students despite the fact that these practices are subversive to larger societal goals surrounding effective science education.
- 2) These practices are triggers for the academic disinterest of African-American male students in school and science.
- 3) Students who are dropping science in school are engaging in complex modes of communication that lend themselves to science outside of school when they are droppin' science.
- 4) A discussion of the implications of dropping science and droppin' science is necessary for the design and implementation of effective science curricula.
- 5) Youths whose voices have been silenced in urban science education are the key to the expansion of the discipline. The inability of the practitioners within the field to consider their perspectives can serve to undermine efforts to connect African-American males and other minoritized populations to the discipline.
- 6) Issues seemingly separate from science education, such as culture, rituals, identity, and stereotypes, may ultimately trigger changes to the exclusionary nature of the discipline.
- 7) Self-reflection and observation are integral to the training and development of urban science teachers and improving the experiences of African-American males in the classroom.

Conclusions

The use of a sociocultural framework that considers the everyday practices of students and teachers in urban science classrooms is imperative for training and developing teachers in urban schools to meet the needs of their African-American male students. The approach to research and practice employed in this article creates opportunities for a more complex understanding of African-American male students who may enact rituals that do not support their own success in the classroom. Furthermore, it allows students who usually have their voices silenced to define both who they are and the potential they have to positively affect the science classroom. Finally, it provides deep insight into the circumstances surrounding how and why teachers enact methodologies that neither support students in science nor include best practices for science teaching as defined by science education research.

The approach to research and practice employed within the work pushes for a more complex understanding of African-American male students who enact rituals that may not support their academic success in the classroom, but who are deeply connected to the discipline when given an opportunity to do so. The overarching goal of this discussion is to validate the voices of individuals who have been marginalized in their attempts to realize their potential in the field of science.

References

American Association for the Advancement of Science. (1993). *Benchmarks for science literacy, Project 2061*. New York: Oxford University Press.

- Becker, H. S. (1963). *Outsiders: Studies in the sociology of deviance*. New York: The Free Press.
- Bourdieu, P. (1986). The forms of capital. In J. G. Richardson (Ed.), *Handbook of theory and research for the sociology of education* (pp. 241-258). New York: Greenwood Press.
- Bourdieu, P. (1993). *The field of cultural production: Essays on art and literature*. Cambridge: Polity Press.
- Brookfield, S. D. (1987). *Developing critical thinkers*. San Francisco: Jossey-Bass.
- Brown, B. (2004). Discursive identity: Assimilation into the culture of science and its implications for minority children. *Journal of Research in Science Teaching*, 41, 810-834.
- Burt, R. (2001). Structural holes versus network closure as social capital. In N. Lin, K. S. Cook, & R. S. Burt (Eds.), *Social capital: Theory and research* (pp. 31-56). New York: Aldine de Gruyter.
- Buxton, C. (2005). Creating a culture of academic success in an urban science and math magnet high school. *Science Education*, 89(3), 392-417.
- Carter, L. (2007). Globalization and science education: The implications for science in the new economy. *Journal of Research in Science Teaching*, 44(10) 165-181.
- Catsambis, S. (1995). Gender, race, ethnicity, and science education in the middle grades. *Journal of Research in Science Teaching*, 32, 243-257.
- Coffey, A. (1999) *The ethnographic self-fieldwork and the representation of identity*. London: Sage.
- Coleman, J. S. (1988). Social capital in the creation of human capital. *American Journal of Sociology*. 94, 95-121.
- Coutinho, M. J., Oswald, D. P., & Best, A. M. (2002). The influence of sociodemographics and gender on the disproportionate identification of minority students as having learning disabilities. *Remedial and Special Education*, 23, 49-59.
- Cross, W. E. (2003). Tracing the historical origins of youth delinquency & violence: Myths & realities about black culture. *Journal of Social Issues*, 59(1), 67-82.
- Denzin, N. K., & Lincoln, Y. S. (1994). Introduction: Entering the field of qualitative research. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 1-17). Thousand Oaks, CA: Sage.

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- Ellis, C. S., & Bochner, A. P. (2006). Analyzing analytic autoethnography: An autopsy. *Journal of Contemporary Ethnography*, 35(4), 429-449.
- Emdin, C. (In press). The rap cypher, the battle, and reality pedagogy: Developing communication and argumentation in urban science education. In E. Petchauer & M. H. Hill (Eds.), *Schooling hip-hop*. New York: Teachers College Press.
- Emdin, C. (2007). Exploring the contexts of urban science classrooms. Part 1: Investigating corporate and communal practices. *Cultural Studies of Science Education*, 2, 319-41.
- Emdin C. (2010a). *Urban science education for the hip-hop generation*. Netherlands: Sense Publishers.
- Emdin, C. (2010b). Affiliation and alienation: Hip-hop, rap and urban science education. *Journal of Curriculum Studies*, 42(1), 1-25.
- Ferguson, R. F. (1998b). Teachers' perceptions and expectations and the Black-White test score gap. In C. Jencks & M. Phillips (Eds.), *The Black-White test score gap* (pp. 273-317). Washington, DC: Brookings Institution Press.
- Germann, P. J., Haskins, S., & Auls, S. (1996). Analysis of nine high school biology laboratory manuals: Promoting scientific inquiry. *Journal of Research in Science Teaching*, 33(5), 475-499.
- Grimshaw, A. D. (1982). Sound-image data records for research on social interaction: Some questions answered. *Sociological Methods and Research*, 11(2), 121 -144.
- Goffman, E. (1967). *Interaction ritual*. Garden City, NY: Anchor Press.
- Jasanoff, S. (1991). Acceptable evidence in a pluralistic society. In D. G. Mayo & R. D. Hollander (Eds.), *Acceptable evidence. Science and values in risk management* (pp. 29-47). New York: Oxford University Press.
- Kahle, J., Meece, J., & Scantlebury, K. (2000). Urban African-American middle school science students: Does standards-based teaching make a difference? *Journal of Research in Science Teaching*, 27(9), 1019-1041.
- Krugly-Smolka, E. (1996). Scientific culture, multiculturalism and the science classroom. *Science & Education*, 5, 21-29.
- Lee, O., & Luykx, A. (2004). *Science education and student diversity: Synthesis and research agenda*. A monograph supported by the Center for Research on Education Diversity, and Excellence (CREDE) at the University of California at Santa Cruz and the National Center for Improving Student Learning and Achievement (NCISLA) University of Wisconsin in Madison press.

- Lemke, J. (2001). Articulating communities: Sociocultural perspectives on science education. *Journal of Research in Science Teaching*, 38(3), 296-316.
- Losen, D. J., & Orfield, G. (2002). *Racial inequity in special education*. Cambridge, MA: Harvard Education Press
- Mezirow, J. (1990). How critical reflection triggers transformative learning. In J. Mezirow (Ed.), *Fostering critical reflection in adulthood* (pp. 1-20). San Francisco: Jossey-Bass.
- Miller, A. I. (1996). *Insights of genius: Imagery and creativity in science and art*. Cambridge: MIT Press
- Morse, J. M. (1994). Designing funded qualitative research. In N. K. Denzin & Y.S. Lincoln (Eds.), *Handbook of Qualitative Research* (pp. 220-235). Thousand Oaks, CA: Sage.
- Norman, O., Ault, C. R., Bentz, B., & Meskimen, L. (2001). The black-white "achievement gap" as a perennial challenge of urban science education: A sociocultural and historical overview with implications for research and practice. *Journal of Research in Science Teaching*, 38(10), 1101-1114.
- National Science Education Standards. (NSES, 1995). Retrieved January 23, 2009, from: <http://www.nsta.org/publications/nses.aspx>
- National Science Teachers Association. (NSTA, 1998). The national science education standards: A vision for the improvement of science. *Teaching and Learning: An NSTA Position Statement*. Retrieved January 23, 2009, from: <http://www.nsta.org/>
- Portes, A. (1998). Social capital: Its origins and application in modern sociology. *Annual Review of Sociology*, 1-14.
- Seiler, G. (2001). Reversing the "standard" direction: Science emerging from the lives of African American students. *Journal of Research in Science Teaching*, 38, 1000-1014.
- Songer, N. B., Lee, H. S., & Kam, R. (2002). Technology-rich inquiry science in urban classrooms: What are the barriers to inquiry pedagogy?. *Journal of Research in Science Teaching*, 39(2), 128-150.
- Sparkes, A. C. (2000). Autoethnography and narratives of self: Reflections on criteria in action. *Sociology of Sport Journal*, 17, 21-41.
- Stanley, W. B., & Brickhouse, N. W. (1994). Multiculturalism, universalism, and science education. *Science Education*, 78(4), 387-398.
- Tobin, K., & Roth, W. M. (2005). Coteaching/cogenerative dialoguing in an urban science teacher preparation program. In W. M. Roth & K. Tobin (Eds.), *Teaching*

JOURNAL OF AFRICAN AMERICAN MALES IN EDUCATION

Together, Learning Together (pp. 59-77). New York: Peter Lang.

Turner, J. H. (2002). *Face to face: Toward a sociological theory of interpersonal behavior*. Stanford, CA: Stanford University Press.

Turner, J. H., & Stets, J. E. (2006). Sociological theories of human emotions. *Annual Review of Sociology*, 32, 25-52.

Zeldin, S. (2002). Sense of community and positive adult beliefs toward adolescents and youth policy in urban neighborhoods and small cities. *Journal of Youth and Adolescence*, 31(5), 331-342.

Zumeta, W., & Raveling, J. S. (2002, Winter). Attracting the best and brightest. *Issues in Science and Technology*, 36-40.

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