Reversing the “Standard” Direction: Science Emerging from the Lives of African American Students

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Abstract: Recognizing the persistent science achievement gap between inner-city African American students and students from mainstream, White society, this article suggests that the imposition of external standards on inner-city schools will do little to ameliorate this gap because such an approach fails to address the significance of the social and cultural lives of the students. Instead, it is suggested that the use of critical ethnographic research would enable educators to learn from the students how science education can change to meet their aims and interests. The article includes a report on how a science lunch group in an inner-city high school forged a community based on respect and caring and how this community afforded African American male teens the opportunity to participate in science in new ways. © 2001 John Wiley & Sons, Inc. J Res Sci Teach 38: 1000–1014, 2001

Introduction

In his 1933 classic, The Mis-education of the Negro, Woodson described the uselessness of both the technical and liberal education then being offered to African Americans. He decried the lack of consideration for African and African American culture in the American educational system. More than half a century later our educational system continues to ignore the culture and consciousness of African American students and thus continues to miseducate them. Despite standards, high-stakes testing, and compensatory programs, wide disparities remain between the achievement of African American students from conditions of urban poverty and that of students from the majority culture. From an analysis of data from the National Assessment of Educational Progress (NAEP), sponsored by the Department of Education, Rodriguez (1997) found persistent differences in performance between students of African and Anglo-European descent. This gap increases over the course of schooling, he found, based on a comparison of 9-year-olds, 13-year-olds, and 17-year-olds. Researchers studying literacy development (e.g., Labov, 1995) have pointed out that at the start of school African American students from the inner city have a
much less significant achievement gap as traditionally measured than the gap by high school. Thus, the failure of the educational system to teach and inner city African American students appears to be cumulative and progressive and has not been diminished by recent reforms.

Attempts to minimize this gap continue to rely on externally imposed standards driven by assessment and accountability. Recognizing the lack of success of these reforms in improving the education of African American students from conditions of urban poverty, I have been investigating the possibility of beginning with the capital of the learner, not with external standards. I have come to envision student involvement in research and curriculum development as a way to reverse the power structure of school, which has been oppressive to urban African American students. I desire to describe and document the possibility of creating a community involving urban Black male teens focused on science and an ethos of caring and respect. Secondarily, I am interested in recognizing that the everyday lives of African American inner-city males are rich sources for science and that within them lies great potential for curriculum development, which emanates from students’ lived experiences. The work described here, as well as the construction of the article itself, provides an opportunity for the students’ voices to be heard and acted on in a science curriculum. And finally, I am eager to examine the usefulness of a methodological approach grounded in critical theory in facilitating these goals.1

This article draws on my experiences over the past 2 years (1998–2000) at City High School (CHS),2 near my university. CHS is a public school of 2,300 students, of whom 97% are African American. About 87% are from low-income families. Average daily attendance hovers near 60%. In 1999 at CHS the average verbal and math scores on the Scholastic Aptitude Test (SAT) were 356 and 371, respectively. These scores are well below the state’s average scores of 417 and 462. The percentage of students graduating in 4 years at CHS is 43%. Only 9% of the students at CHS scored at or above the Basic level on the SAT-9 tests. Thus, CHS represents a school that miseducates its African American students.

CHS is organized into Small Learning Communities (SLCs) following a school-within-a-school model. Each SLC, consisting of 200–250 students and about seven teachers, focuses on a theme and is designed to foster an atmosphere of community, which is often lacking in such a large school. I have been involved in the Sports, Enterprise, and Technology (SET) SLC. The science curriculum implemented in this SLC has very low expectations for student achievement, is poorly coordinated and fragmented, and closely resembles Haberman’s (1993) “pedagogy of poverty.” The experiences described by CHS students demonstrate that they have been silenced and marginalized (Tobin, Seiler, & Walls, 1999; Seiler & Tobin, 2000). In the following statement by the SET’s coordinator, she recognizes the failure of the school to prepare students for college, to provide them with valuable alternatives to college, and to prepare them for those alternatives:

The population here is one that often doesn’t do well in college simply because they’re not prepared for what they need to do in college. A number of them go the first year, but how far they get is another issue. But an awful lot of the youngsters see college as their only option, which I think is as odd as not seeing it as an option at all. But here everybody [the teachers] is under this delusion [that] everybody’s gonna go to college. It’s nonsense. It doesn’t happen.

Indeed, the last issue of the school newspaper for the 2000–2001 school year listed only three seniors from SET with college acceptance letters, all of which were from the local community college. The coordinator’s comments are evidence of the unresponsive nature of the
curriculum and mission of this SLC to the students’ needs and interests. To form a science community that would allow science to emerge from and respond to the students’ lives was a goal of the science lunch group reported here.

The Failure of Standardization

The National Research Council’s 1996 National Science Education Standards (NSES) and the American Association for the Advancement of Science’s Project 2061 (Rutherford & Ahlgren, 1990) are the best-known science standards. They provide content standards, performance standards, and assessment frameworks in science education. Okhee Lee (1999) noted 90% agreement in content standards between the NSES and Project 2061; thus, they represent an agreed-on core body of knowledge. However, these documents portray the nature and history of science largely in terms of the Western science tradition and thus represent an assimilationist perspective (Lee, O., 1999). Rodriguez (1997) faulted the NSES for their “discourse of invisibility” regarding ethnic and racial minorities, citing numerous ways in which the recommendations in this document allude to but never tackle the question of teaching diverse student populations in meaningful ways. These standards-based reform documents more or less unquestioningly accept the understandings and habits of mind of the Western scientific tradition. They perpetuate the deeply ingrained belief system of mainstream White society and of science, which has worked well for students from privileged groups but not for students from other racial and social backgrounds. There appears in these documents little room for science to change in response to what others bring to it. A few science educators have called for a more reflexive relationship between science and all people. For instance, Barton (1998) suggested moving away from a one-science-fits-all approach and toward a science that welcomes diverse interests, aims, and positions.

The academic success of urban African American students continues to lag despite attempts to remedy the situation through multimillion dollar standards-based educational reforms. These reform efforts have attempted to change teaching and learning through the imposition of uniform curricula and assessments and have largely ignored the social, cultural, and historical contexts in which the curricula are taught and the assessments are done. Proponents of such reforms suggest that once the core knowledge and skills are specified and connected with assessment, incentives, and penalties, higher levels of student achievement will result. Thus, it is assumed that having one set of standards for all students will lessen the achievement gap. Critics of this approach suggest many reasons to doubt its effectiveness, and no attempt to summarize the many arguments will be made here. Instead, the article will focus on one aspect of the critiques—that the implementation of standards-based curricula will continue to fail to improve achievement in urban settings of poverty because they ignore the sociocultural, political, and economic contexts of the individual students in the schools affected by the standards. They do not take into account the individual uniqueness and collective diversity of the learners in these contexts and thus have not included the voices of the students. They neither address the interests and aims of minority students, nor do they connect with what these students know and can do. The reforms outlined in the NSES and Project 2061 will do little to empower and change the status of these students because standards-based reforms erroneously assume that what is spelled out in the standards documents satisfies the desires and purposes of all students (Sleeter & Grant, 1991). These reforms have resulted in enforced summer school and the retention of large numbers of students in their current grade. Such failures have been attributed to student deficiencies without considering why and how the schools—in their curricula, cultures, and structures—have failed these students.
In many ways the standards represent more of the same in curriculum design and planning. For students from middle- and upper-class families the current curriculum works and might even be improved by standards (Labaree, 1999), but it does not work for students from the lower end of the social-class system, and ratcheting up conformity to the curriculum will not change the role of schools in social reproduction (Bourdieu & Passeron, 1977). Our school system has for quite some time existed as “two parallel systems— one privileged, adequate, successful, and largely White; the other... disabled, starving, failing, and African-American” (Ayers, 2000, p. 66). The standards movement has intensified and will continue to exacerbate this dichotomy.

A Critical Methodological Approach

Critical ethnography combines the methodology and theoretical frames of critical theory and ethnography. Drawing from feminist research, neo-Marxism, and Freire’s “emancipatory” theory, critical ethnography provides a methodological framework to document, analyze, and act on the discriminatory practices supported by schooling (particularly urban schooling). This approach enables researchers to use student experiences to challenge norms and practices in education. Built on the belief there is no neutral education and no neutral educational research, it allows and necessitates that educators make a political commitment to the struggle for liberation of the oppressed and thus provides a bridge between research and activism (Barton, 2001).

My own approach to critical research in education has emerged from 16 years of experiences as a teacher and 2 years as a researcher, and in particular from my involvement in the difficult school setting at CHS. I use critical ethnography to expose the injustices and inequities created by a hegemonic system of schooling and attempt to change it through critical pedagogy and curriculum development. All research participants and stakeholders are contributors, learners, and researchers. The roles of the participants extend beyond the traditional labels of researcher and researched, such that all participants (in this case 8 students and me) are afforded the opportunity to have their goals met, though each may have a different set of goals. Injustices and inequities in science education are addressed through inclusion of their curricular ideas at the high school and in the teacher education program as well as through the expression of their voices at conferences and in articles.

Using this hybrid theoretical frame, which combines critical ethnography and critical pedagogy, I have begun to investigate ways to teach, organize schools, design curricula, and prepare teachers that will voice students’ lives. The following sections describe what has been learned from listening to student voices about school and how an attempt has begun to try to undo in concrete ways the silencing of students in school and in the design of curricula.

Reversing the “Standard” Direction

Educators from the perspective of critical multicultural education recognize the significance of making room for students’ voices in school and in curriculum reform; however, this is not a new idea. In 1938 Dewey wrote about the need to make learning authentic and to allow it to grow from the students’ interests. This rarely occurs, and the positioning of students as the “silent recipients of schooling” (Nieto, 1999, p. 191) is even more pronounced in inner-city schools, where elective courses and student choice are usually absent.

Many science educators suggest that students must be given opportunities to come to think and talk like scientists through access to the participation rules of school and science. But what are these rules? Whose rules are they? Is there any room for negotiation? That all students must have access to science has been interpreted by many educators to mean that students must be
enculturated into the ways of being of mainstream science and learn the dominant discourse and rules of participation (American Association for the Advancement of Science, 1993). Because school typically reflects White, middle-class experience (Bourdieu & Passeron, 1977) and has little relevance to the lives of marginalized students, these norms may not even be valid as starting points in science class. An emphasis on the acquisition of certain ways of speaking and interacting in order to be successful in school and society has devalued minority students’ own ways of being (e.g., Gee, Michaels, & O’Connor, 1992) and has inflicted symbolic violence on them (Bourdieu, 1992). In addition, it has done little to allow significant numbers of marginalized students to move into the mainstream. Some might argue that access to high-status knowledge opens doors to wider options in society. However, this view ignores the complicating aspect that knowledge in itself is worthless and only acquires power in interaction with the knower’s desires and purposes (Sleeter & Grant, 1991). In the science lunch group we attempted to locate science within the desires and purposes of the lives of African American male teenagers.

The preservation and continued development of alternative cultures among African Americans is an important part of their response to their position as an oppressed minority. Anderson (1999) described the emergence of a parallel culture, which he calls the “code of the street.” In poor inner-city neighborhoods such as the one where CHS is located, respect has a central role and is a form of cultural capital. As a means of survival, children acquire a repertoire of behaviors that garner them respect on the street and thus provide them with security. This campaign for respect is carried into the school, and it becomes a staging area in the struggle for respect. A teenager’s way of being on the street runs counter to the norms of school behavior, and this conflict is played out daily in science and other classes at CHS. For these reasons, the importance of gaining and offering respect among Black male teens was allowed to emerge as a guiding principle in our lunch group.

Rather than an ethos that empowers students, time spent in an urban high school such as CHS often yields a different impression. Most of the teachers and administrators spend a great deal of time trying to make students acceptable by mainstream standards and students spend an incredible amount of time defining who they are in speech, dress, and other actions (Patthey-Chavez, 1993; Anderson, 1999; Tobin, Seiler & Walls, 1999). This tension between the goals of the teachers and those of the students is manifested in the conflict between the curriculum, particularly as regimented by standards, and what the students bring to school, their culture, and their life experiences. Wertsch (1990) suggests expanding our view of valid mental performances beyond those traditionally valued in formal instructional settings such as schools. In these settings logical/deductive reasoning is the privileged way of thinking. Wertsch proposed recognition of different sets of ways of knowing and coming to know that are equally useful and necessary. Carol Lee (1992, 1999) took the ideas of Cole and Vygotsky and began to look at the interplay between knowledge structures generated outside the classroom and knowledge structures embedded in school learning. By exploring the connections between them in literature classrooms, she was able to recognize the students’ cultural funds of knowledge and described ways to use a cultural modeling framework to scaffold from one to the other. In most cases pedagogy and curriculum are designed to silence students (Fine, 1991), and this is particularly true in science classrooms, where talk usually avoids figurative language, emotional or value-laden words, and references to human experiences (Lemke, 1990). Critical theory and critical pedagogy provide theoretical frames to envision how curricula and schools might be designed by beginning with the students. In this way curriculum has the potential to be “a design for social futures” (New London Group, 1996, p. 73).

Writing from a psychological perspective, Boykin (1986) examined the psychological position of African Americans in relation to society, stating that Black culture is in almost
dialectical opposition to the culture of mainstream America. “To characterize Afro-Americans as culturally different from Euro-Americans is not graphic enough. To the extent that the Black experience reflects a traditional West African cultural ethos, the two frames of reference are noncommensurable. There are fundamental incompatibilities between them” (p. 63). Boykin enumerated at least nine dimensions of Black culture that have emerged from its West African roots. Reference to a few will illustrate the incompatibility with Euro-American culture. An African American belief in the influence of nonmaterial, vital forces in people’s everyday lives contrasts with the Euro-American faith in material, mechanistic forces. African American culture values affect, whereas White culture values reason. The former orients toward expressive movement, the latter toward impulse control. Interconnectedness and community are important in African American culture, while separateness is prized in mainstream White culture. Thus, the ideology that underscores society’s institutions including schools strongly opposes the central aspects of African American culture. Orientation to these patterns or cultural styles acquired from family and community leads to conflict with the explicit values and beliefs of the dominant society. However, Boykin suggested, although the cultural differences are profound, a cultural difference model is too simplistic to be able to capture the complexity of the Black experience in society and in our schools. He described a “triple quandary,” in which African Americans must simultaneously negotiate in three realms: mainstream White culture, African-rooted Black culture, and the status of an oppressed minority. The triple quandary becomes particularly salient once an African American child enters school and is more complex than what is presented by a cultural mismatch explanation.

Boykin (1986) saw four planes of interactions between children and school: what children do and do not do, can and cannot do, will and will not do, and should and should not do. That the emphasis in schools is on the first two is manifested in curriculum and classroom management (what children do and do not do) and performance objectives, testing, and standards (what children can and cannot do). The other two planes are largely ignored. What children will and will not do is connected with issues of motivation, interest, choice, and persistence. What children should and should not do reflects values and beliefs. These aspects of school interactions are particularly important given the incompatibility of African American culture with White culture and the previous experiences of the children in such oppressive and hostile institutions as schools. Schools, in my opinion, need to address issues of choice, motivation, and values as aspects of students’ identities, and this is what was attempted in our science community.

“You Can’t Teach Somebody That Don’t Want to Learn”

Though I had taught science for 16 years and was an experienced urban teacher, I was shocked by the low expectations that CHS teachers had for their students, by the fragmented curriculum, by the lack of laboratory activities in science classes, by the reliance on transmission methods of teacher talk and handouts, by the seemingly senseless selection of which topics to teach, and by the lack of interest students showed in their classes. While coteaching in the school, I began talking with students and interviewing them about their schooling. Ed Walls, a student in the Incentive SLC, became a coresearcher. The first year of ethnographic research at CHS (Tobin, Seiler & Walls, 1999; Seiler & Tobin, 2000) gave voice to and made us aware of students’ perspectives on repression, injustice, and curriculum failure at the school.

Ed was in Incentive because he had been removed from his original SLC at CHS for excessive absences and repeated failures. During the year (1998–99) he worked with us, he was
a ninth-grader for the third time. By his own reporting, Ed was kind of a scary-looking character. He explained his belief that most of the NTAs (nonteaching assistants who served as security personnel) were either scared of him or thought he was a “thug,” both reasons to get him out of school (Toussaint, 1997). “People say it’s my hair. When they look at my hair, they think that I’m going to do something wrong.” Ed’s hair was often in cornrows, dreadlocks, or, when between styles, untamed and wild.

During the period of his involvement with us in research, he was struggling to stay in school, to get there on time, and to maintain good attendance. Ed hung with a street crowd (Anderson, 1999), yet he was proud that, unlike his brother and most of his friends, he had never had a parole officer. Ed’s views on teaching and learning were sophisticated and became important to us. As Boykin’s issues of motivation, persistence, and values might suggest, Ed continually reminded us that “you can’t teach somebody that don’t want to learn.”

Ed was intricately involved in our research. Though he raised some eyebrows the first times he strolled through the Graduate School of Education (GSE), he soon became a familiar figure around GSE. He often sat in on our science-methods class and became known to the science student teachers. With us he attended the Ethnography Forum as well as the Spencer Urban Research Symposium, both held annually at our university. We provided him with financial and academic support. We tried to reenlist Ed in our research team for a second year, but he seemed to be drifting more and more to the street scene (Anderson, 1999). Though we kept in touch, Ed’s attendance and performance in school continued to slide downward. Partway through the year Ed was dropped from the school roll because of excessive absences. Still ambivalent about his education (Ogbu, 1992), Ed recently has begun attending Twilight School, an after-school program designed to award a diploma in a shorter time.

My experiences with Ed and the other students led me to believe it is not enough to provide a voice to a marginalized student or to work one on one to try to alter that student’s schooling experiences. I decided to take what I had learned from Ed and the others and to attempt to build a new type of science community in this setting.

The Science Lunch Group

A science lunch group was organized in which 8 male students met with me once each week to eat lunch, talk about their lives, and talk about and do science-related activities. The purpose of the group was to enable the students to learn some extra science and to help science educators like me figure out how to do a better job of teaching science to students like them. This was how the idea was introduced to them when they were asked if they wanted to participate. Their interest in learning more science and in affecting the way science was taught in their school was what they said motivated them to join. When quizzed by another student, Cyrus responded, “Miss Gale came to us and said, ‘Do you wanna learn science?’ We said yeah. First, she didn’t say nothin’ about no food. We just volunteered and said yes. She just lookin’ out for us with all this. We here for the science part.”

The ethos of the lunch group was vastly different from the rest of the high school. We talked and ate while seated on old sofas in a room in the basement and moved to an open area of the room to carry out our science investigations. Students rarely missed a session. New students clamored to be included, and they were grilled by the original participants, who questioned, “Do you really wanna do science?” All lunch sessions were audiotaped and transcribed, and some were videotaped. In the following sections I will use discourse and other examples from the lunch group to illustrate how this community contrasted with traditional science education practices, how their whole lives were part of the conversation, how their street code and cultural
funds of knowledge were embraced, and how the nature of science and participation in it was extended.

Pushing the Boundaries of Science

We began our science lunch group by talking about what the students liked to do outside school. As we discussed playing basketball, baseball, video games, and drums, watching wrestling, cutting hair, and composing rap, we came to consider the question “Is there science in that?” After the first meeting I no longer asked that question, as it came from the students. Each week’s activities were jointly planned based on what we talked about in the previous weeks. Using balloons to explore Newton’s laws led Kareem to ask, “Can you bring in some helium balloons?” Encounters with helium helped us understand characteristics of gases related to density and how these affect the vocal chords and hitting a baseball in Denver. Two of the young men are talented drummers. Dawud suggested, “I got drums, different sizes and shapes; we can play.” Using these and other materials we investigated what attributes of a drum affect its sound, the physics of sound and music, and connected this to the vocal chords and the eardrum.

As we ate together at the beginning of each session, the conversation ranged across many topics, from report card grades to church trips, to girls, to sports, to social issues. Strong opinions and concerns were voiced, many of which overlap with science in important ways. During talk about sex and AIDS Chris expressed doubt about the mainstream theory of the origin of the HIV virus: “Quit playing; you don’t believe that. I know where AIDS really came from.” There were more topics than we had time to explore within our group. I was guided only by a desire to tap into Boykin’s (1986) untouched areas of interest, choice, and motivation of Black students. We accumulated a list of topics and questions that came from these students. A sample of their interests included how tall buildings and bridges are built, the physics of a wrecking ball, salt- and freshwater aquariums, lizards as pets, and the science they saw in movies and in TV wrestling. Keeping this running list was significant in a number of ways. It reaffirmed for all of us that our talk and work were connected to science. This was important because we were battling our own and others’ perceptions that science is a collection of facts laid out in a book and not a collection of topics connected to everyday lived experiences. Barton’s (1998) critique of the national science standards called for this sort of “reflexive science,” in which the boundaries of science itself can change. The list was also a resource as we developed more curricula with and for the students in this SLC. Rather than beginning with Eurocentric science as represented in the documents of the standards movement, we began with what the students knew, could do, and wanted to do.

Cultural Funds of Knowledge

These students belie stereotypes of African American teenage males from the inner city. They are smart, perceptive, hard working, funny, clever, creative, sensitive, kind, and successful in many ways. Though constrained by their triple quandary position (Boykin, 1986) and their status as members of an involuntary minority (Ogbu, 1992), in many ways they personify Freire’s (1970) “know-how,” and this knowledge has been a key to their survival thus far in an unjust, racist society. For instance, an important molding force in Cyrus’s life is the barber shop where he has been employed for 4 years. From the men who work and gather there he has learned not only how to cut and style hair but also about the importance of working hard and being responsible. Cyrus brings this important part of his life with him when we talk about and do science, as do Jarren and Dawud with their interest in drums:
20 **Dawud:** First of all, how you tune your drum. You got to have common sense. If you just try to tune it in a circle, it’ll be off, and you keep starting over.

21 **Author:** What are you even doing when you tune a drum?

22 **Dawud:** You take a key and tighten it. The lugs going down on the rim onto the head. You tighten the head.

23 **Author:** And what does that do?

24 **Dawud:** Changes the sound. When it’s tighter, it sound one way, and when it’s loose, it sound another way.

25 **Cyrus:** It’s the same way at my job, right? When I’m cuttin’ hair, if the clippers don’t sound a certain way, I take a screwdriver and twist the screw in the side. Somethin’ getting loose. So if it gets low and slower or increase the sound and become faster.

26 **Author:** What else changes the sound in drums?

27 **Dawud:** The shape. The wood.

28 **Cyrus:** If it’s hollow.

29 **Jarren:** The size of the wood, like the shell, how thick it is or how thin it is.

30 **Cyrus:** If it’s hollow or solid.

31 **Jarren:** Some drums is birch. Some drums is maple. They even make plastic drums, fiberglass.

In their talk about drums and hair clippers the students recognized science in their everyday experiences, and I recognized them as experts. In Turn 20 Dawud explained how to tune a drum. Though they did not express it using scientific terminology, both Dawud (Turn 24) and Cyrus (Turn 25) showed an understanding of the connection between the frequency of vibration and the pitch of a sound. Here they used their own discourse patterns to engage in science talk. In Turns 26–31 they described several physical factors related to how a drum sounds. The cultural funds of knowledge (Lee, C., 1999) demonstrated here have been largely unrecognized by the schools they have attended. This is in danger of worsening under the force of standardization, which would allow even less room for the sounds of drumming and hair clippers (Ayers, 2000).

Occasionally, when one of the regular students was absent, someone brought a friend. Akheem is one such student who attended the group a few times. He is considered a troublemaker by the staff and somewhat out of control by his peers. Yet he has a deep interest in natural science that runs counter to stereotypical images of an inner-city teen who adheres strongly to the street code (Anderson, 1999).

I like to ride my bike and to collect snails and stuff like that. Snails and snakes, garter snakes and stuff like that. Near 48th street. We be down there near the supermarket and stuff like that, going all the way in the back catchin’ ‘em. When it’s real moist and wet and stuff, they come out like that. You just catch ‘em, me and my friend Anil. We catch garter snakes, snails, worms, roaches, and stuff like that. If you ever been in my basement, it’s all different types.

The tendency in curricular reform to avoid consideration of students’ motivations, interests, and values (Boykin, 1986) continues to place these students in danger of being miseducated and undereducated. In our group we began to enact science lessons that started with what students knew, could do, and were interested in. This has been described (Cole, 1998; Lee, C., 1999) as building on the cultural funds of knowledge that students already have. We began to attempt the “harnessing of social resources for the transformation of teaching and learning” (Moll & Greenberg, 1990, p. 344) of science. During my time at this high school I have identified, within
the students’ extant repertoires, abilities and ways of thinking, talking, and being that are useful in science (Wertsch, 1990). The oral ability of students to argue passionately and coherently as well as their recall and facile use of facts and statistics has amazed me on numerous occasions. Impressed by their expressiveness (Boykin, 1986; Asante, 1991) I wanted to look more closely at what they did and to understand how it connected with science. I asked the students what they would like to debate or argue about, and they suggested basketball. In essence, adopting Lee’s (1992, 1999) idea of scaffolding, the students used newspapers and other resources to build a case to support their choice for the most valuable player (MVP) of the National Basketball Association. Needless to say, the time (near the end of the NBA regular season) and place (Philadelphia, home of the 76ers) made possible a heated debate, complete with graphs, statistics, anecdotal evidence, and videotaped arguments. Using Lee’s concept of cultural modeling, a review of the videotape enabled the students to revisit and reflect on what they were doing when they presented their arguments. Next, they relied on the same skills to forge a science argument, using data on the nutritional value of fast food to buttress their positions. This topic was chosen based on prior conversations about food, nutrition, and health. In the course of the activity the students’ verbal adeptness was recognized (by both me and themselves) as a positive attribute, one that could be valued in science and in school. Although this was not one of their explicit goals, I believe these kinds of activities can be important in the self-actualization of the students and in changing the ethos of the group. Our experiences in the science lunch group show the breadth and strength of the cultural funds of sciencelike knowledge and skills that exist in the lives of these students.

Changing the Power Structure

The hegemony of those who held the knowledge and the power was dismantled as week after week the students enacted their ideas about science. The students’ regular science classes followed the standard format of teacher-directed science instruction. Interactions often followed the initiation-response-evaluation (IRE) pattern described by Lemke (1990). The following instance illustrates the contrast between traditional science classroom discourse and the interactions in our group. At the end of the session I bounced a basketball on the floor, then a tennis ball, and then I held the tennis ball on top of the basketball and let them fall. The tennis ball flew far up and hit the ceiling.

50 Author: Watch what happens when I do this.
51 Dawud: It bounced off the basketball.
52 Chris: Dang.
53 Darnell: The way it shot off.
54 Author: Why? Do you see the difference?
55 Dawud: Yeah.
56 Jarren: Cause that has more force than it does.
57 Kareem: I know why. The ball has more mass, right, so the tennis ball kind of lifts up, and as it comes down, it bounces off the ball.
58 Cyrus: The ball has more matter.
59 Dawud: Do it the other way around.
60 Kareem: Do it the opposite way around. See what happens. The big ball on top. [I drop them with the basketball on top.]
61 Dawud: See, because the ball has more matter.
62 Author: Let’s stay with the first way. Explain to me why the tennis ball goes so much farther.
63 Dawud: I don’t know why it goes so much. ‘Cause it’s lighter.

64 Lawrence: And it bounce off the basketball.

65 Author: But why doesn’t it do that when it bounces off the floor?

66 Darnell: It’s like you jumping on a trampoline, giving you more force to go.

67 Akheem: It’s like the moon and the earth. It’s like the moon is, you know...

68 Dawud: He losing me now.

69 Akheem: I lost myself. [I drop them again with the tennis ball on top.]

70 Lawrence: You see that? The basketball has more mass.

71 Darnell: I know what happens — I know what happens.

72 Jarren: Play it back in slow motion. [I was videotaping the group.]

73 Darnell: When it’s dropped, the tennis ball loses it [the basketball], and when it bounces back up, it gives it a push, like a extra force.

The long sequences of student cross-talk uninterrupted by teacher talk (Turns 66–73) are uncharacteristic of talk in science class (Lemke, 1990). Here students repeated and built on each other’s ideas. In Turns 57 and 58 Cyrus added to Kareem’s idea that a basketball has a greater mass, explaining that it “has more matter.” In Turns 63 and 64 Lawrence completed Dawud’s sentence. Dawud had suggested that a tennis ball reacts as it does “‘cause it’s lighter”, a statement Lawrence added to in the next turn by beginning with comment with the connective and. In Turn 67 Akheem mirrored Darnell’s speaking form by beginning his statement with “It’s like,” just as Darnell had. Both students used analogies in their explanations. The students made suggestions to me about ways to advance their understanding (“Do it the other way around,” in Turn 59, and “Play it back in slow motion,” in Turn 72). This type of student involvement is practically nonexistent in the science classes I have seen at CHS and illustrates the role of student–student interaction in their construction of knowledge. The students themselves introduced and were the sole users of such scientific terminology as “force,” “mass,” and “matter.” They appeared more willing to attempt the appropriation of scientific discourse in the lunch group than in their regular science classes, which will be further explored in future articles.

It is important to remember that these are students who might easily be labeled “at risk,” might score poorly on standardized tests, might not finish high school, and probably will not succeed in college. Such students are stereotypically perceived (Toussaint, 1997) as not capable of being involved in science talk such as this. From the experience of the lunch group, it becomes apparent how great is the magnitude of the talent and curiosity being squandered and the opportunities being lost by such students being positioned as silent recipients of education.

Campaign for Respect in a Parallel Culture

The students in SET know it is important to show everyone they can handle themselves with others, including peers, teachers, and staff. Respect is a valued commodity on the street (Anderson, 1999), and in school it competes with the mission of the school, where other forms of capital are valued, mainly by the adults. The students, especially the males, are involved in a delicate balancing act between the street ways of interacting needed for survival and the behavioral norms expected at school.

Anderson’s writings and my experiences with students in SET give weight to the importance of what I call the three Rs — respect, rapport, and relationship. For the students, respect, image, and identity are intricately interconnected and are negotiated and constructed in interactions both inside and outside school on a daily basis. Interestingly, the campaign for respect took a different form in our science lunch group than in the halls and classrooms of the school. We were able to establish an ethos different from most classrooms at the high school, and this is evident in the
nature of the discourse within the group (Lemke, 1990). Our relationships were not based on standard assumptions of who holds power. I did not assume that the students would show me respect simply because I was a teacher, a White woman, an adult, or from the university. Instead respect was negotiated interactionally and personally. The provision of lunch was seen by the students as a sign that I truly valued their time and insights.

The strength of the community that formed between us was surprising. Though it was never made an overt rule, the students monitored themselves and each other to enforce a policy of no cursing. I rarely attempted to guide the discussion topics, and the students frequently self-monitored, staying on topic with words like “We ain’t talking about that; that ain’t got nothin’ to do with science.” Mutual respect was important in the group, and it was manifested in a number of ways. They cleaned up after eating and after our science work without being asked to, reprimanding anyone who neglected to do so. I believe that our science lunch community developed this unique ethos for many reasons: attendance was voluntary; the atmosphere was informal; I was not a “real” teacher; we sat on couches as we talked; their voices were the most important; and we shared food. However, I do not believe these are the only reasons, nor do I believe they preclude the establishment of more traditional classroom settings with a similar ethos of respect and rapport. There is continuing research investigating this possibility.

Local Implications for Teaching and Learning Science

In numerous ways the science lunch group and surrounding research are linked to significant developments in the teacher education program and the curriculum in this SLC. In this way the research is catalytic. My work with the science lunch group has significantly altered my ideas about teaching science to inner-city students, and I draw heavily on these new perspectives in the science-methods course that I teach and in my work with prospective teachers. I encourage the new teachers to create space in their lessons for their students’ science interests and cultural funds of knowledge, to design lessons using cultural modeling frameworks, and to create a community with an ethos of respect, as we did in the lunch group. I try to share with the prospective teachers the broadened, more reflexive view of science that I have gained from coming to know these 8 students.

Though CHS is a large school, the existence of SLCs affords an opportunity for the development of different ways of doing school and of designing and enacting curriculum. Beginning with the 2000–2001 school year the name of this SLC changed to Science, Education, and Technology. This name change represents a shift in the focus of the community, led by the SLC coordinator and influenced by the involvement of several of us from the Graduate School of Education at the University of Pennsylvania. We have continued to work with the SLC personnel to redesign the newly named Science, Education, and Technology SLC to strengthen its focus on science and education and to implement the curricular ideas of the students. Building on the science lunch group, we obtained permission to design a biology course in which the curriculum and day-to-day lessons would emerge from the interests of the students in the class. This class was taught during the spring 2001 semester and will be reported on in subsequent articles.

Implications for Science Education

African American students in SET express cultural styles and patterns that have developed in the context of domination and oppression. These cultural and language differences are important markers of personal and group identity and as such are a valuable form of capital to
be maintained, not abandoned, as is often encouraged by school policies and practices (Tobin, Seiler, & Walls, 1999). This parallel culture, so important for their survival and respect, is traditionally devalued by the school and viewed as a deficit that students are encouraged to abandon (Toussaint, 1997). By valuing these cultural attributes and providing opportunities for students to participate in science in their own ways, we reversed the symbolic violence (Bourdieu, 1992) frequently experienced by such students in school.

Working with the young men to recognize the science in their everyday activities represents an important change from adherence to external standards in the way lessons are developed and curricula are decided. Together we have demonstrated ways to connect science with their interests, prior knowledge, and abilities (cultural funds of knowledge) in what I call an emergent curriculum and have shown that process can be directed by the students themselves. It is like following a thread in a weaving or neuronal connections in the brain from synapse to synapse. We start from their interests, pull in their prior knowledge and skills, and end up talking and doing science in ways I have never seen enacted in science classes at this high school.

Some might argue that an approach to science education and curriculum development so driven by student interests would deprive African American students of the opportunity to learn the academic skills needed for gainful employment. I suggest that even in the current climate of standards and assessment, inner-city schools continue to deprive students of this opportunity by failing to meaningfully prepare them. Many students drop out of school, and even those who manage to acquire a high school diploma find that they lack the knowledge and skills to succeed in college, to procure a job that pays more than minimum wage, or to negotiate the mainstream economic world in other ways. I further suggest that schools have failed to prepare urban African American students for success in the world because they continue to emphasize cognitive skills within a context and ethos that represent the dominant cultural ideals of mainstream White society and Eurocentric science and that these are incommensurable with the beliefs and values of the students (Boykin, 1986).

Our list of student topics grew each week, eventually encompassing the chemistry of hair products, the origin of crack cocaine, the safety of cellular phones, and the physics of roller coasters. I believe that critical thinking skills, in the sense of both higher-order thinking and of social critique, can be taught and high expectations maintained while grounding the content in topics connected with and sensitive to the lives and cultural histories of African American students. I also believe that the teaching of many critical skills can be based on abilities and cultural attributes already within the students’ repertoires (Boykin, 1986; Asante, 1991). And, lastly, I believe that mainstream science and science education can themselves benefit and grow from the recognition and inclusion of distinctly African American ways of thinking, being, and knowing.

I see a student-emergent science curriculum and the involvement of students in curriculum design as possible ways to create a science community based on respect and based on science working in a transformational way for the students (Freire, 1970). I believe that through such a process we can begin to address issues of motivation, choice, persistence, and values—what students should and should not do and what they will and will not do (Boykin, 1986)—which have been ignored by the institution of school. By presenting this analysis at national conferences and through its presentation in this article, these inner-city Black teenage males have been given expression in ways that may impact wider conceptions of science and the position of such students in relation to science. At the same time, if incorporated into teacher education and into the redesign of learning communities, student-emergent science may be a potent way to challenge certain norms and practices in science education.
Notes

1 The extent and nature of the science learning that occurred in the science lunch group will be examined in subsequent papers.
2 A pseudonym is used for the school.
3 Privilege pertains to one’s access to capital, power, and success. People are variously economically and socially constrained or privileged by their position in the social class system.
4 The students are Chris, Cyrus, Darnell, Dawud, Jarren, Kareem, Haakim, and Lawrence. They requested that their real names be used. I chose to include only male students to attempt to counter negative stereotypes of urban Black male teenagers and to challenge their absence from mainstream science.
5 In using hegemony to refer to curriculum, I rely on Gramsci’s conception. Hegemony (Gramsci, 1971) refers to an oppressive power structure in which the domination is concealed and the consent of the oppressed is not coerced; rather it is consensual and the oppressed are complicit in their oppression. The dominant ways have become naturalized and normalized.

References


