Expanding Our Understandings of Urban Science Education
by Expanding the Roles of Students as Researchers

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Abstract: In this article, we explore the roles of student researchers as they have emerged over 5 years of studies on the teaching and learning of science in urban high schools. These studies incorporate sociocultural theory in an approach to research that explores the capital that urban students bring to school and situates student researchers as active participants who exercise agency by accessing and appropriating a variety of resources. We provide examples of students engaged as productive, central members of a research team and describe the roles in which they have participated, from teacher educators and science learners to curriculum developers and ethnographers. We show how the involvement of students as researchers, within these roles, allows them to produce and select artifacts and data resources for interpretation that offer unique insider perspectives on how to improve the teaching and learning of science for urban high school students. © 2005 Wiley Periodicals, Inc. J Res Sci Teach 42: 807–828, 2005

All students deserve and must have the opportunity to become scientifically literate. (National Research Council, 1996, p. ix)

Randy: Ain’t my fault they ain’t teach me nothin’.
Ivory: In that school, nobody’s teaching nobody nothin’... Next year, I betchya’ I ain’t learnin’ nothin’ either. (research meeting, 7/01)

Nine years ago, the National Science Education Standards (National Research Council, 1996) articulated a goal of scientific literacy for all students. Despite widespread acceptance of this goal we, as a nation, struggle to achieve it, especially in inner city schools. For example, in classrooms throughout Philadelphia, one of the nation’s largest school districts with more than
50,000 high school students, contradictions to this objective are evident in the observations of student researchers like Randy and Ivory and in the statistics of high failure and low graduation rates in the school they attend. In an effort to improve science teaching and learning such that education is a transformative force in urban youths’ lives, initiatives are continuously introduced and implemented (National Research Council, 1996). However, in a recent report, *Looking Inside the Classroom: A Study of K–12 Mathematics and Science Education in the United States* (Weiss, Pasley, Smith, Banilower, & Heck, 2003), there is evidence to suggest that, despite reform initiatives, the quality of science instruction remains well below the ideal. Research undertaken in a national sample of science and math classrooms indicates that:

> . . . only about a third of lessons nationally are likely to have a positive impact on student understanding of mathematics/science concepts, and 16% are likely to have a negative effect on their understanding; the remaining lessons would likely have no effect, or both positive and negative effects. (p. 42)

With 75% of the population residing in urban centers and the majority of the nation’s students attending urban public schools (Barton & Tobin, 2001), improving the quality of science education for all students places a premium on obtaining insights from research in urban science classrooms.

In this article, we present a blend of salient findings that have emerged over the past 5 years as multiple studies of urban science education have been undertaken in conjunction with one comprehensive neighborhood high school (City High) in Philadelphia. Although the findings are expansive because these studies are ongoing, for the purpose of this article, we focus on sharing what we have learned regarding the role of varying forms of capital, youth identity, and embodied dispositions (Bourdieu, 1992) in science teaching and learning, through our deployment of student researchers as part of an evolving methodological approach aimed to build insider perspectives on the participation and learning of urban youth. Thus, our purpose in this study is not to present findings limited to one particular study but rather to benefit the literature by contributing a summary of findings (in relation to three research questions) emerging from years of urban studies that are deeply intertwined and inform one another. The questions driving the research presented here are as follows:

1. How do teachers build capital with students (e.g., earn respect and build rapport) and thereby afford the learning of students?
2. How does the formation/(re)formation of student identity in fields outside of school affect youth practices in the science classroom?
3. What components of the students’ cultural capital are conducive to their learning of science?

In the initial portion of this paper, we address the first question through a historical look at how the involvement of student researchers began, focusing predominantly upon sharing data from early studies at City High (1998–2000) in which Ken was re-learning to teach in urban settings. The remainder of the paper provides insights into Questions 2 and 3; we focus on studies conducted during the summers of 2001 and 2002 when four City High students joined our research team in expanded researcher capacities. These students remained central to our team and continued to participate in subsequent and ongoing studies.
The Need for Different Theoretical Lenses

Nondeficit Conceptions of Culture and Marginalized Communities

Although the challenges facing urban schools and the science achievement of marginalized communities continue to be cited, the development of educational policies aimed to remedy the situation are far from effective. We contend that the trends of science education in urban settings will continue if theoretical frameworks of cultural poverty, deprivation, and social reproduction continue to inform research. We find these theories to be hegemonic—laden with deficit views of marginalized youth and with a static view of culture. Moreover, these theories reinforce the cycles of oppression experienced by the urban poor by asking us to focus upon understanding academic failure in terms of finding out what is wrong internally with a child or externally, in his/her home and neighborhood surroundings (McDermott & Varenne, 1995). Not only do these lenses tend to place the blame on the youth, or in the best case on his/her immediate home surroundings, they limit conversations from addressing the complexities of social life and understanding that students’ academic failures are “a product of our own activities” as a society (McDermott & Varenne, 1995, p. 331). Culture then can no longer be viewed as being created in isolation, bound to particular settings, nor as being deterministic in nature. Rather, we argue that, in addition to new methodological approaches to urban science education research, we need expanded theoretical lenses for understanding culture and the dialectical relationship between structure and human agency.

In our research, culture is dialectically conceptualized as a system of symbols, the associated meanings, and practices; such a system is loosely bounded so that symbols, practices, and associated meanings originating in one field may appear within another (Sewell, 1999). Fields, places where culture is enacted (Swartz, 1997), are structured by the human and material resources available to support the agency of participants and are weakly bounded (Sewell, 1992), thereby allowing culture that “belongs elsewhere” (i.e., predominantly associated with other fields) to be enacted in a given field. Building from Sewell’s critique of and departure from Geertz’s (1973) long-standing traditional view of culture, we regard the culture of urban youth as a resource to afford their learning of mainstream discourses such as science, and their appropriation of science to meet goals in multiple fields in and out of school. In doing so, we move beyond traditional notions of science as products and processes, science as argument, and science as products and intentions to the studying of science as culture and the learning of science as cultural production, reproduction, and transformation. Thus, a major focus of our research lies in recognizing, from the practices of urban youth, those aspects of their capital (Bourdieu, 1992) that connect to the learning of science in ways that are potentially transformative to them. We look for ways in which cultural practices from other fields are enacted in science classrooms and afford student learning. Moreover, through investigations of the enactment of culture, we focus on identifying patterns and contradictions to those patterns.

Methodology

Issues of civil rights—indeed issues of equity and social justice in the urban place—are central threads in a diverse fabric that comprises the core of urban science education studies. (Barton, 2002, p. 3)

Urban schooling in its current form is limited in its potential to afford social transformation for its students (e.g., Haberman, 1991; Knapp & Plecki, 2001; Songer, Lee, & Kam, 2001); schooling, in fact, contributes significantly to the “stratification” of society (Barton & McLaren, 2001). Understanding that educational practices are oppressive, particularly for urban youth from
marginalized communities experiencing severe poverty (Freire, 1993), and considering that critical theory encourages participatory critique, empowerment, transformation, and social justice (Kincheloe, 1998; Lather, 1986; Pizarro, 1998), we believe others (e.g., Barton, 2001; Seiler, 2002) have found critical ethnography to be an ideal methodological approach to studying science teaching and learning in urban settings. A critical research process invokes a goal of determining the existence of injustice, finding methods for altering it, and identifying the sites for transformation (Kincheloe, 1998). Specifically, critical ethnography is a form of critical research that goes beyond interpretive and naturalist research and is ultimately concerned with the structural transformation of society and the emancipation of individuals through the revealing of dominant social ideology. Thus, in engaging critical ethnography, we are committed to studying science classrooms with the goal of transforming them. In addition, because such a methodology calls for the affordance of the agency of those involved in the research, we have developed and are using research methods that do more than describe and interpret as we plan and enact research. Specifically, over the course of 5 years, we have worked to restructure traditional researcher roles as well as to expand our notion of whom is central to the research process within our studies of the teaching and learning of science.

**When Students Become Researchers**

Although it is becoming common to include teachers as central participants in qualitative educational research (Doerr & Tinto, 2000), the involvement of student researchers is much more limited. Typically students’ roles are restricted to the inclusion of their voices in others’ stories and providing member checks on the interpretations of adult researchers. However, evident through our work and that of others (e.g., Barton, 2001; LaVan, 2004; Wassell, 2004), there is growing progress toward involving students in more empowering research capacities, which is rooted within Freire’s (1970) call for both teachers and students to function as critical agents and problem-solvers through expanding their ways of knowing and questioning and by taking ownership of their ideas. Steinberg and Kincheloe (1998), in their edited book addressing multiple education disciplines, *Students as Researchers: Creating Classrooms that Matter*, further Freire’s notion and advocate student researcher roles that are clearly political and challenge “dominant forms of ideology (constructs that maintain status quo and its unequal power relations by producing particular meanings and interpretations of reality), and conventional purposes of education” (p. 3).

Through our work, we argue that the need for student researchers is profound within urban settings, especially as traditional methods of engaging students in research reinforce unequal power hierarchies between the researcher and the researched. Such power differentials are particularly acute across boundaries of age, race, and class, and these borders are pronounced in urban settings that are characterized by a majority of people from minority populations and conditions of severe poverty on both individual and neighborhood levels. Moreover, because “knowledge generation within research is understood as an active, context-based process influenced by the values, histories, and practices of the researcher and the community in which the research gets done” (Barton, 2001, pp. 905–906), there exists great danger in perpetuating schooling inequities and reinforcing hegemonic structures shaping accepted schooling practices when researchers may be “other” in regard to those they seek to understand. In fact, more often than not, research findings emerging from urban settings are saturated with middle-class ideology that can further hegemonic structures of urban schooling. In accordance with a critical ethnographic methodology, then, we have developed new windows into the lives of urban youth, to contest the privileging of our voices as the adult, university-based researchers and so as not to put forth claims rooted in our own experiences of research, teacher education, and teaching and
learning of science in institutions where the teachers and students may have shared social and cultural histories similar to our own. ¹

Consequently, we contend that students in urban settings must be involved in urban science education research in ways that allow them to help us to “challenge the common sense views of reality with which most individuals have grown so comfortable” (Steinberg & Kincheloe, 1998, p. 2). This article challenges traditional views as we share the emergence and development of student researcher roles within our program of research and the ways their involvement has allowed our understandings of urban science education to expand along new pathways. Specifically, we address the community from which we recruited student researchers, the roles and associated tasks in which they engaged, the resources they utilized, and the methods by which we gradually included them more substantively in data collection and analyses.

Methods for Data Collection, Analysis, and Interpretation

We have worked with student researchers over a wide variety of researcher roles (e.g., teacher educators, interviewers/interviewees, ethnographers, and science learners/curriculum developers) across social fields, including the workplace, neighborhood, and the science classroom. Although these roles have varied across time and context, what has remained consistent is our endeavor to include students as central members of our research team, our resolve to learn from them in deeply meaningful ways, and our willingness to alter our approaches to research and the roles and practices of participants. The major question that then arises to the reader may be regarding what methods for data collection/production, analysis, and interpretation were utilized to remain consistent with our methodological commitments to conducting empowering, educative, and catalytic research. This question becomes even more important because we hold our research practices to Guba and Lincoln’s (1989) four authenticity criteria in which authentic research requires researchers to change their constructions as a result of doing the research; is educative to all of the participants; catalyzes changes that afford the goals of the participants; and creates opportunities for all members of a community to benefit from being involved in the research, especially those who could not easily help themselves (Guba & Lincoln, 1989; Tobin, 2000).

We have worked with numerous student researchers at City High for varying periods of time over the years; however, the data and interpretations presented in this article have emerged from longitudinal work with specific students. We highlight research conducted with one of the first youth members of our research team, Tyrone, as well as share data connected with 4 years of work with a group of four students. ² The methods we have engaged include traditional and atypical types of data collection as we attended the science classes of these student researchers, particularly in their ninth, tenth, and eleventh grade years, and as we participated as senior members of the research team during three summer sessions. ³ We video- and audiotaped their science classrooms as well as recorded their work with us at the University of Pennsylvania during the summer sessions. In addition, we obtained formal interviews (audio- and/or videotaped formats) spanning the 4 years, with each of the students. As discussed later, the interviews were conducted mostly by the students. We also recorded informal conversations with student researchers as well as cogenerative dialogues (Roth & Tobin, 2002). In addition, the students kept reflective journals describing lived experiences and interactions within the research setting during each summer. We saw journaling as a powerful tool for contemplating upon one’s feelings and reactions to incidents within a research environment. Across the summers, we worked with students on ethnography projects, gradually introducing and encouraging the incorporation of theoretical frameworks into their work. In addition, throughout our presence in the various
research environments, we wrote field notes—to remember what occurred during science lessons or following interviews, the viewing of videotapes, and listening to audiotaped research sessions.

While we invoked these traditional data-gathering techniques, we also worked with students to produce more unique artifacts—which included, but were not limited to, transcriptions; self-authored raps; data from internet research; video analyses; ethnographies; independently designed interviews; the production of a science-related movie and rap videos through video-editing software, such as Imovie and Final Cut Pro; and presentation materials associated with dissemination activities, such as seminars and professional conferences. To produce such artifacts, the student researchers needed preparation and training in both technical and theoretical areas. For instance, they learned to utilize transcribers and video-editing equipment/software. In addition, for curriculum development roles, the students had to understand content-specific knowledge (e.g., concepts of frequency, amplitude, standing waves). Moreover, to assist us in the analysis and interpretation of artifacts they produced, we introduced them to theoretical constructs that inform our research, particularly sociocultural concepts such as culture, structure, agency, schema/ideology, hegemony, different forms of capital (social, cultural, symbolic), and dispositions. In this manner, it became possible to actively engage their assistance in the interpretation of data being generated. They were able to apply understandings of sociocultural theory to select patterned actions of themselves and others. For example, students watched hours of tapes from a variety of contexts (i.e., neighborhood streets, homes, classrooms, research work place) to identify segments that they found to illustrate the building and/or loss of social, cultural, and symbolic capital (Bourdieu, 1992). In some cases, they identified salient vignettes of student—student interactions or teacher—student(s) interactions; we also asked them to focus on their own interactions and to help themselves and us become more aware of their dispositions (Bourdieu, 1992). Because dispositional resources are mostly unconscious, in addition to theory, we introduced the concept of microanalysis as a method for analysis and interpretation for the extensive video footage collected. We explained and engaged in activities to emphasize the importance of slowing down or speeding up video to recognize patterned actions. For instance, Rowhea shared some of her microanalytical work with students to provide them with examples of the process through which subtle movements (e.g., the slight gesture of a finger) can be identified and why that could be salient in a science classroom. In addition, we studied relationships of agency and structure through conversations and writing activities around actual footage from their science classrooms, select readings (e.g., Bad Boys, Code of the Street, and Flyy Girl), and instructional movies (e.g., Dangerous Minds and Stand by Me). With time, students were able to engage in video analysis to identify and create edited vignettes that illustrated student agency (i.e., access and appropriation of material and/or human resources [Sewell, 1992]). Each of the roles and tasks the students engaged in helped us to obtain further insights into their interests, dispositions, and the conscious and unconscious aspects of their identities that impact their learning of science and would have otherwise been inaccessible to us. Thus, here we exemplify how some of these artifacts and, more importantly, the processes through which they were produced, proved to be significant interpretive resources for understanding how science might be enacted differently in comprehensive neighborhood high schools.

Pathways to Insider Interpretations

The present studies of scientific literacy and the extent to which it can be accessed and appropriated by urban youth began in 1997. At that time, Ken was convinced of the benefits of including high school students as teacher educators, to assist teachers “to better teach kids like
us.” When Ken began to teach science in an inner-city high school, to afford his roles as teacher educator and researcher, he quickly realized that he needed insider perspectives to inform his practices and further learning (Tobin, 2001). His teaching practices were in constant breakdown and most of what he believed to be good teaching did not appear to work when he taught urban youth, most of whom were African American and from home circumstances of economic hardship. Ken had to learn to use interpretive frameworks and associated practices that were culturally appropriate for the youth he was teaching, to adopt ways of teaching to enable his students to take advantage of what they knew and could do.

We first began to work with urban high school students as researchers in a low-track, small learning community⁴ (SLC). The opportunity to employ Tyrone⁵ as a student researcher arose from Ken’s search for a student who could critically review his teaching and provide suggestions on how to create and sustain more productive learning environments:

Ken: I first met Tyrone on a day when he was victim of unfair treatment from a teacher who had seen Tyrone violate a school rule at an assembly and had stepped in to reprimand him. Tyrone was removing his jacket because he was hot and his actions were somehow misinterpreted. Soon the problem became not only the initial violation but also Tyrone’s aggressive verbal retaliation against what he considered to be an unfair and unwarranted attack from the teacher. I watched much of the unfolding drama with another teacher, and as soon as possible, after the event, I spoke to Tyrone about the incident. He was rational and bright, as well as very “street” [Anderson, 1999] in the way he spoke and presented himself. He wore his hair in dread locks at a time when not many students styled their hair in that way and he had a front tooth missing. He maintained that he was always experiencing unfair treatment from those in authority because they anticipated that he would cause trouble and did what they could to get him expelled. Whether or not that was their strategy, Tyrone was suspended often. So much so, in fact, that he repeated grade 9 for the third time before dropping out of high school.⁶ When Tyrone explained to me that he could not get a job at MacDonald’s due to his physical appearance, I decided to hire him as a researcher⁷ in a study of learning to teach in urban high schools.

Students as Teacher Educators

One of the initial roles we developed for student researchers involved their active participation as teacher educators. They acted as consultants, advisors for prospective teachers, and they also produced artifacts that were utilized within the university teacher education program to improve the practices of teaching within their urban school:

Ken: Tyrone was available as a consultant to my graduate students and participated willingly, to the extent that he adopted the practice of dropping by for my classes. In the process he learned some of the theory we used in our teacher education program and he also began to browse through some of the texts that I used as references for the course. Tyrone began to prepare himself for his work by reading texts about urban education, minorities, and social theory back in my office.⁸ Initially I was amused by this practice but soon came to realize just how useful it would be to our research. We also deployed the student researchers as experts on learning in an urban comprehensive neighborhood high school. As such they presented a symposium to teacher education students seeking high school certification. Their responses during an associated question/answer session with professors, graduate students, and high school science teachers provided greater insights than would have been possible from the artifacts alone or a presentation involving their use.
It quickly became apparent that Tyrone made an excellent student researcher/teacher educator as his perspective was always strong and articulate. His arguments were internally consistent, and he typically spoke on issues with passion and conviction. We included him on many panels, with his peers, to speak to prospective teachers because he fitted the role of expert with aplomb and his wisdom provided food for thought. Incidentally, we found that some of our most interesting artifacts, interpretations and insights have come from those students who have been labeled as “at risk,” “resistant,” or possessing dispositions that are counter to the traditional school culture, as defined by middle- and upper-middle-class Eurocentric values. Students like Tyrone can provide voice to the population of students typically marginalized in school.

_Learning About Respect_

We regard the counsel that student researchers, like Tyrone, have provided concerning respect in classrooms as a breakthrough for urban teaching, for it is starkly contrary to the culture enacted in their comprehensive neighborhood school where strict discipline and “in your face” techniques are practiced by teachers, nonteaching assistants, and even the principal:

Ken: Early on, Tyrone had me wondering about whether or not to take his advice on “Don’t teach ‘em if they ain’t gonna learn. They’ll come to you when they wanna learn.” There were many reasons why this advice seemed not to make sense. However, when you consider that respect is the currency of the inner-city street realm (Anderson, 1999), then Tyrone’s advice made perfect sense. As a basic concept, if students did not want to learn, and I tried to make them engage, it provided them with opportunities to earn their peers’ respect by disrespecting me. Yet, Tyrone’s analogy was even blunter and more vivid. “You go to them when they ain’t wanna learn they gonna treat yo’ like a ho.” As hard as it might seem, that was exactly what I was experiencing, although putting Tyrone’s advice into action ended up being no easy matter.

Mediating social interactions is the accumulation and appropriation of various forms of embodied and material capital (Bourdieu, 1992). Respect, then, can be conceptualized as a form of symbolic capital or a means by which one’s status or the identity others attribute to you can be built, lost, or exchanged for other forms of capital (e.g., social and/or cultural). On neighborhood streets among the youth, status may emerge through objectified symbols of culture (e.g., particular clothing or shoes) or through embodied dispositions (e.g., movement—dance and orality—rap or playin’). This symbolic capital can be exchanged for social capital; for example, group membership, and contribute to the safety youth can experience in their neighborhoods (Elmesky, 2003). In addition to understanding the centrality of respect in inner-city neighborhoods (Anderson, 1999), through developing teacher educator roles for student researchers, we have gained deep insights into understanding respect as a highly valued form of currency in inner-city classrooms. Moreover, due to the porous boundaries of fields, this symbolic capital is often built in similar manners inside classrooms among peers for the purposes of exchange outside of school.

Following Tyrone’s successes as a researcher and a consultant to urban science teachers, we continued to involve several urban youth in much the same ways9; then, during the summer of 2001, we embarked on new waters by employing five student researchers to participate in our research on teaching and learning science in urban high schools for 4 hours a day for several months.10 Within the summer research context, we continued to engage the students’ skills as teacher educators, and although these researchers collaborated with us several years after Tyrone,
there were stark similarities in their perspectives regarding teaching and learning, and coherent patterns emerged that reemphasized the significance of respect in urban classrooms:

Ms. Rana: What makes a good teacher?
Shakeem: Now, if you one of them people where you feel as though you got put out a strong image, ya’ know, a straight image to gain respect and to gain attention in your classroom because that’s how it’s been in the past. Well I think you should just see who you workin’ with. First be yourself...I think they should start out bein’ theyself. If you are naturally a person who wants stuff done at a certain time cuz you think that’s how you supposed to do it... hey, stay that way because you try to be somebody else is what screws your class up...

Ms. Rana: How does a teacher build up a relationship with a student?
Shakeem: You got to keep your eyes open, man. Pay attention to ‘em and stuff...don’t be all up in his grill. I mean, damn, don’t be “Hey, what you do this weekend...Oh, really, did you do this?”...It’s cool but not all up in his face everyday, you should...I think you should just sit back and observe your students for a little while and then when you can—like pick up on a change in attitude. You know.

In the above interchange that occurred between Shakeem, in a “teacher educator” role, and Ms. Rana, his new ninth grade teacher,11 his evaluation of teachers and teaching were similar in many ways to Tyrone’s. Interestingly, both young men recommended teaching practices that are nonintrusive and sincere—Tyrone warning against acting “like a ho” and Shakeem cautioning against being “all up in his grill.” Moreover, what these student researchers have communicated to us is supported by studies (e.g., LaVan, 2004) on creating classrooms characterized by cultural “fluency” in urban high schools. LaVan also found that students possess clear images of teaching practices that communicate respect and disrespect, and they need spaces within the research process for their voices to be heard:

I hated her in the beginning. She was boring and I thought she disrespected me every opportunity she got. Instead of asking me what was wrong she yelled at me, was very disrespectful, which made me mad a lot of times so I resisted, didn’t do work in class, talked to my friends, and tried to just slide by... (Ace, student electronic journal, reflection of his teacher, 2003; cited in LaVan [2004], p. 2)

Unconsciously and/or consciously, teachers can engage in practices that are culturally incongruent with their students, and this contributes to their struggle to establish respect in the classroom and gain the symbolic capital of “teacher.” When teachers engage in practices that communicate disrespect, their classrooms tend to be characterized by failed, nonsynchronous interactions and the generation of negative emotional energy (Collins, 2004), and they find their practices in constant breakdown and/or reactive (rather than in-time) to the unfolding events. Culturally incongruent practices contribute to the lack of solidarity between teachers and students within urban science classrooms, especially when teachers and students are culturally and socially “other” (e.g., LaVan, 2004; Wassell, 2004). Hence, although we had identified the importance of both teachers and students building and maintaining respect, we had much to learn to be able to fully comprehend the semiotic meanings associated with the concept of “respect” for urban youth. We needed to be able to understand the structure of cultural fields, outside of school, in which they participated. We needed images of the practices, symbols, and meanings that exist therein, the human and material resources that are accessible to young people and impact the
formation of their dispositions as well as ideas of how student agency and identity are shaped consciously and unconsciously. Ethnography projects undertaken by student researchers across three summers have been a significant tool for opening dynamic doorways into such understandings.

Students as Ethnographers

Although we wanted to learn more about student researchers’ homes and neighborhoods, and the aspects of those fields (i.e., cultural symbols, practices, and underlying/associated meanings) that they regarded as salient to their learning of science, we could not ignore the fact that we would be outsiders in those fields and unable to accurately represent culture and develop useful understandings for research purposes. As we tried to overcome these obstacles to building authentic understandings, we first engaged students as interviewers and interviewees, and then expanded student researcher roles to include that of ethnographer. That is, we created opportunities for the youth to select and capture data resources (e.g., via videotaped raw footage) and then to create edited representations or narratives of their experiences in fields outside of school. Rather than traditional ethnography, using approaches that typically involve the written description of the cultural experiences of others, we encouraged the youth to engage in self-ethnography across three summers to, in some cases, reflect on earlier life events to communicate values, interests, and goals, and in other cases to identify the forms of capital and cultural resources that they possess. The term “self” is utilized to emphasize that these were not external studies of spaces that the students participated within; rather, self-ethnography empowered the insider perspective—student researchers’ voices—as it was their choice of which stories they wanted to share from their life-worlds.

Students as interviewers and interviewees. The initial way that we found “insider” knowledge of “outside” spaces could be accessed was when student researchers conducted interviews with peers as well as being interviewed by other student researchers. In fact, we realized that our learning trajectory increased dramatically when students spoke to each other rather than exclusively to adult researchers:

Ken: One of the most useful roles I envisioned for Tyrone was that of interviewer, and we were not let down. In fact, during the 2 years in which he worked with us as a researcher, interviews were perhaps Tyrone’s greatest contribution. He carefully planned structured interviews and then identified students from throughout the school to ask about life at school and at home. We soon noticed that students were more comfortable speaking to Tyrone about their lives at home, in the streets, and at school. He asked questions that we may have asked if we were to do the interview, but the students were more relaxed with Tyrone and seemed less likely to try to figure out what sort of answer he was looking for. Accordingly, the interviews seemed authentic and we had access to data that we normally would not get.

Thus, one of the research tasks we utilized to expand students’ roles as researchers is the activity of interviewing. In some cases, we wrote out a list of questions or discussion topics to guide their interviews of fellow students or of other student researchers; in other cases, the youth were asked to independently devise interview questions. During the summer researcher sessions, we began to make a shift toward student-generated ethnography to provide varying descriptors of social life in a variety of fields. In addition to interviewing one another, their family members, neighbors, and friends, the student researchers also captured video footage; in this manner, they were able to chart their life events over the years and provide practical and theoretical insights into the ways they participated in their neighborhoods. In preparation, some of the student researchers
would develop specific questions, so that, through a video interview format, they could provide more information regarding the events, people, and locations that they chose to record. Typically, the student researchers chose to produce edited movies of their neighborhoods and interviews with residents and PowerPoint presentations to represent aspects of their lives out of school. However, rap and poetry were genres that were also used. For example, each summer Ivory chose to write, memorize, and perform a rap capturing her life experiences. She would also transcribe the rap and provide an explanation of the lyrics.

*Learning about urban students’ identities.* We perceive identity as constantly being formed and (re)formed (Roth, Tobin, Elmesky, Carambo, McKnight, & Beers, 2004). More than simply a way of defining your own sense of self, the making and (re)making of identity is a social and cultural process. Thus, identity is the dialectical interplay between how one defines him/herself and the way that others in the community define him or her. Identity and respect, then, are recursively interconnected because identity develops differently depending upon the capital (e.g., symbolic capital in the form of respect) that an individual holds and upon whether or not others see him or her as having access and power to appropriate the resources in a field. Through student researchers’ work as ethnographers, represented in artifacts using video, PowerPoint, poetry, and rap, we are able to learn about daily practices engaged by youth on the streets and in their homes as well as to begin to obtain insight into students’ identities in various fields and the ways in which those identities affect their participation in science classrooms. For example, in one of her ethnography raps, Ivory provides salient insights into her identity and her life experience. In so doing she provides clues as to what we might expect of her as a student of science and what she might expect from her science teacher:

1. I’m going to tenth [grade]
2. Been headed towards college
3. I see my young bulls walking the streets like they got it
4. On the corners 20 deep selling drugs like the cops forgot it
5. And get a hold of these 9s and 22s
6. Then talk like they got the runs
7. Still don’t know what a thug is about
8. First to talk about spraying guns
9. People say I rap hardcore sometimes real
10. I’m a ghost writer
11. Ain’t no other cat that’s hotter...
12. I broke my finger playing football
13. Still will play any day
14. I play sports with injuries
15. But ball all the way
16. Life I think is really weak and dead in a way
17. You got crimes suicides and murders each day
18. Any night I get down and pray
19. It’s really nothing more I can say
20. I’m spitting from the da bridge life is hard to survive
21. And that’s a triple threat if you step against I.

With her rap name of EB Marvelous, Ivory depicts pride in her excellence as a rapper and rap author. The rap expresses Ivory’s goal of attending college and projects a competitive spirit and determination to succeed in the fields of academe and sports (lines 2 and 12–15). Ivory regards herself as a triple threat and formidable opponent should anyone choose to oppose her (line 21).
These attributes of identity suggest that in her science class Ivory will be a determined learner who is proactive in accessing human and material resources and, in situations in which there is shortage, she would be expected to compete with her peers. The rap also suggests she is unlikely to give up if the demands are high or to allow frustration and obstacles to divert her from her determination to succeed. The rap provides a caution for teachers to be aware that Ivory may project herself into a situation that she perceives as advantageous for learning through (what could be perceived as) aggressive modes of participation. For example, Ivory has been observed as being loud in her efforts to be heard and gain attention during science lessons (e.g., “Where’d that come from, though? You can’t do that!”), and she might willingly leave her seat to make a point or to access and appropriate resources that are not proximate. Moreover, Ivory has identified such practices as evidence of her agency as a science learner during our data analysis sessions.

Much of Ivory’s rap provides insights into life in her neighborhood. She makes specific reference to the overconfidence of “big-talking” male youth (line 6) on downward trajectories, the prevalence of drug dealing, and a tendency to act as if they are immune from prosecution and harm (lines 3–8). Ivory alludes to the fragility of life and her experience with violence and murder (lines 16–20). These insights provide a contrast to our experiences and to Ivory’s science teacher because we have not encountered murder and rarely experience violence or drug-associated activities. The rap is informative in that we can be aware that Ivory and urban youth generally have succeeded in surviving and navigating dangerous circumstances and, in so doing, they have knowledge, skills, and dispositions that have served them well and are resources on which the learning of science might build. For example, Ivory helps us to understand how the “big” talk of urban youth, which is useful in establishing respect and warding off danger on the street, might find its way into the science classroom as students strive to make sense of the curriculum (e.g., Elmesky, 2003) as well as to gain or maintain respect or symbolic capital with peers. Thus, Ivory facilitates our recognition of the necessity for science teachers in urban schools to find ways in which students can maintain respect within their youth subculture and, at the same time, participate in science.

In Shakeem’s ethnographic work, he has shown us that navigating fields that are structured differently requires African American male youth, like himself, to develop and maintain multiple and sometimes contradictory identities. He introduces the dichotomy of “gangsta” and “gentleman,” and emphasizes the importance of being “both/and” rather than “either/or.” He presents us with alternating images of Shakeem as a caring young teen who appreciates hard work, good friends, and family and Shakeem as a young man who aggressively demands respect from peers through freestyle rap, slang talk, and “bustin’ strategies” or practices that earn respect by disrespecting others (Sterba, 2003). For example, in his video ethnography, we watch Shakeem playfully demeaning and threatening his friend so as to coerce him into rapping on camera. “We got this ‘ho’ down here. Yo rap, man before I . . . Yo rap, dog!” Shakeem also shares images of different interactions with family and friends in his grandmother’s neighborhood where he was living at the time. His fondness for his cousin and her two young daughters is evident as he teases her about what costume she’ll wear for Halloween and marvels over the intelligence of the older daughter. Shakeem’s strong sense of loyalty and caring for younger youth in the neighborhood is apparent later in the tape as we listen to him introduce and speak with his “adopted son” who is working in a garden:

Shakeem: This my young boy, Steve, ya mean12; helpin’ out the community. Makin’ a home for these plants. Tryin’ to make the world a better place?

Steve: Yup.
Shakeem: He a rapper too!! You can tell he’s gonna look out when he get older. You gonna come an’ support the community when yous a rapper, Steve?
Steve: Yes.
Shakeem: You better look out.
Steve: I am.

Shakeem’s grandmother provides a home for him when things become unstable with his mother. As his temporary caretaker, the grandmother struggles to make sure he has enough shirts and pants for his school uniform and new shoes to start off the school year. Shakeem cuts her grass, reads her the mail, buys groceries for her when he has money, as well as warmly pokes fun at her age and associated aches and pains. In addition to caring for his grandmother, he financially and emotionally supports family members going through difficult times. For example, he called from work to console a relative when her van got repossessed and discreetly leaves cash at her house to help pay late utility bills.

In a school in which poverty is widespread, Shakeem has fewer economic resources to access than most of his peers and even fewer following his assistance with those who need among his family and friends. Shakeem has learned to ignore the sarcasm directed by some peers toward the signs of his poverty that are part of his being, such as few and soiled clothes or reliance on free meals and free tokens to travel on public transport to and from school. The lack of money to pay for laundry more than once a week combined with a limited number of shirts, for example, detracts from the symbolic capital he holds and can result in what could be interpreted as resistance if a teacher were to call on a student like Shakeem to go to the chalkboard to display some work. Understandably, Shakeem would avoid humiliation in front of his peers by refusing to go. Hence, it is important that teachers be on the lookout for indicators of poverty so as to not inadvertently place students like Shakeem in places where peers can use their oral skills to disrespect him due to his poverty.

Although some males choose to build financial resources by engaging in illegal activities, including the drug trade, Shakeem is determined to earn money to support himself and his extended family without having to sell drugs. Thus, even though drugs and violence are parts of Shakeem’s life, his adamancy against building such an identity is clearly expressed on one of his slides of a PowerPoint presentation developed in conjunction with his video ethnography:

It’s so many drug dealers on da 5th it’s a shame. The average person would think a poor black kid would see the drugs and sell it because of their financial problems, but I’m just the opposite. I go to school and learn so I don’t have to sit out in the rain, sell that sh*t and duck from the law. F**K THAT!

Without the social and symbolic capital afforded by dealing drugs or at least owning particular clothing and sneakers, Shakeem pays close attention to other ways of building social capital that will afford a “gangsta” persona and respect among peers. In a recent presentation at an international meeting of ethnographers, Shakeem described how at school he works the hallways and lunchroom to talk to peers and socially interact with them depending on their status and the respect he affords them. This creation and maintenance of social networks is important for Shakeem, more so for his life out of school than for his academic performance. Yet, because the boundaries that separate school from the other fields in which he participates are porous, practices from those fields are enacted by Shakeem, frequently without conscious awareness, as he builds social capital in school. So, inside school, he interacts with youth in manners common to the street field—for example, he may fight to defend himself, rap, smoke weed, and use profanity.
Due to the porous boundaries between those fields from outside of school and those in school, Shakeem is continually required to resolve contradictions between his “gangsta”-motivated identity and the identity expected by school norms. He means well and wants to succeed in school, yet some of his practices make success less likely than he or we would like. As part of catalytic authenticity, we have constantly intervened on behalf of Shakeem to reverse decisions to suspend him and even expel him from school. Shakeem has many attributes that would guarantee his success if only teachers would encourage him to use what he knows, can do, is interested in doing, and is disposed to do. Shakeem, and his peers, need regular encouragement to get involved and stay involved in activities associated with the learning of science. Recognizing what Shakeem knows and can do as resources he can use to learn is an important requirement. However, it is important too to realize that earning and maintaining respect is central to Shakeem’s identity, and he will do what he has to do to retain his status among his peers. Teachers might have to accommodate and align activity systems in which students like Shakeem can sustain their identities associated with maintaining and earning respect while learning science.

Forming Deeper Understandings of How Urban Youth Learn Science

By expanding the roles of student researchers to include interviewing and ethnography, we have become more attentive to the unconscious enactment of culture as well as more capable of understanding how identity is reinforced by the structures of fields outside of science classrooms, and the internal turmoil and contradictions that can arise as youth attend school. This is particularly important as we rethink scientific literacy and look for different images of how science learning can successfully occur in urban classrooms.

Students as Science Learners and Curriculum Developers

In order to gain deeper understandings of how urban youth learn science, during our summer research sessions we also asked the student researchers to participate in capacities that included the roles of science learner and curriculum developer in addition to teacher educator, ethnographer, and interviewer/interviewee. Our principal interest was to have our group of researchers involved in science-related activities that were “school-like” so as to: (1) study the extent to which different instructional approaches afforded their learning; (2) assist us in selecting relevant activities that could mediate between their cultural capital and canonical science; and (3) develop culturally appropriate curriculum resources. For instance, during the first summer, we focused on presenting the student researchers with opportunities to learn general physics concepts related to sound and we gained deep insights into the teaching and learning of science through their successful development of a curriculum enhancer—a movie entitled “Sound in the City.” By asking the student researchers to produce such a movie, we expected the youth to learn physical science concepts regarding sound such as frequency, velocity, wave properties, period, wavelength, amplitude, standing waves, and wave reflection. As they engaged as learners, we looked for the ways in which they utilized human and material resources to make sense of and represent scientific concepts. We expected that such an artifact would sharpen our understandings of how urban youth’s cultural resources, and specifically unconscious dispositions, could help them both reproduce and produce the culture of science. Although a certain amount of science culture was reproduced in the form of terminology, diagrams, and definitions of concepts related to sound, such as when May explained amplitude through a universally recognized wave diagram, the movie as a whole also presented evidence of cultural production.

In creating the movie, May, Ivory, Shakeem, Randy, and Tim were able to utilize their researcher roles to share their embodied knowledge and practices associated with other fields
within a context of learning science. In addition, the youth were more than passive participants; they were actively expanding their own physics understandings of sound and developing methods by which they could represent the science to engage students in lower grades. They were encouraged to “be themselves” so that the dispositions they unconsciously invoked on a daily basis, could emerge through skits, rap, dance, posters, and their use of simple props as they made sense of conceptually ideas associated with sound. In the remaining portion of this article, we focus upon two of nine dispositions (“movement” and “verve”), which are described by Boykin (1986) as central dimensions of the Afro-cultural experience. Movement, refers to “an emphasis on the interweaving of movement, rhythm, percussiveness, music, and dance, which are taken as central to psychological health” (p. 61). A second disposition, verve, is “a propensity for relatively high levels of stimulation, to action that is energetic and lively” (p. 61). While we selected this theoretical lens for making sense of students’ dispositions, we identified these as highly salient through our work with student researchers. For example, in interview data, student researchers spoke about “living life to a soundtrack” and music being “part” of them. They also described how these ways of being (i.e., beating a tempo on a desk, rapping aloud, or wearing headphones) consistently resulted in negative consequences in school because they are considered inappropriate and/or a distraction to the curriculum. In addition, during theoretical sessions where we focused upon understanding different forms of capital, the students identified video footage in which they or others were invoking dispositions of movement and verve (e.g., rap performances or dance) as examples of cultural resources for peers’ building of social and symbolic capital with each other. Even when the researchers were asked to select a series of video vignettes of effective teaching, they chose ones that revealed teachers incorporating high energy, motion, and rhythmic ways of being in the classroom. Moreover, throughout the artifacts produced as part of the research, the majority of student researchers incorporated movement and verve to demonstrate originality and creativity and to build social and symbolic capital with their research peers. The “Sound in the City” movie represents an artifact that is replete with examples of movement and verve, and it was during its production that we became acutely aware of the ways in which these dispositions contribute to the teaching and learning of science.

The wave dance: Learning about verve and movement. One of the numerous examples of how Sound in the City revealed the student researchers’ embodied dispositions within a context of science learning was their decision to include, as an “intermission,” video footage that had been captured when dance practices, in the form of “battle,” spontaneously erupted within the research space as the youth participated in science activities:

Rowhea: The “wave dance” began the day I brought in a plastic multicolored slinky as a resource to engage the students in experimenting with translational and longitudinal wave movement, standing waves, and wave reflection. I had just finished taping the slinky to the wall when, suddenly, I found Randy grasping the slinky with one hand and holding Ivory’s hand with the other. Shakeem was playing some “beats” on the computer. They started to dance to a beat that seemed so perfect, yet what was so profound was the manner in which they moved to give the illusion that a translational wave of energy was passing through their bodies, through the slinky, and then reflecting back in the opposite direction. Without discussion or deliberation, the two researchers began to utilize dispositions of verve and movement to demonstrate the movement of sound wave energy. Later, following the spontaneous outburst, I asked them consciously to verbalize what had occurred. Anticipating that the segment would later become part of the movie, Ivory explained to the camera: “Today, we’re going to show you how—by usin’ this slinky, as you see, how the wave can travel as the energy goes through us an’ the slinky—our body an’ the slinky using well, it’s called battle from where we come from.”
Slowing down the video of their dance to frame-by-frame speed, we could follow the pattern of movement in remarkable detail. Ivory began the dance with her head turned in the direction of her left arm. As she arched her left arm downward, her head turned to Randy who then began to arch his left arm upward, drawing Ivory’s right arm upward simultaneously. For a thirtieth of a second, Randy and Ivory’s heads were turned to each other as their arms were both extended fully upward, mimicking a wave crest. Then, with Randy initiating the descent, both lowered their arms. Just as they had reached a rest, Randy turned his head to face the wall while simultaneously arching his right arm to “pass” the wave of energy to the plastic slinky. As the wave reflected off the wall, the reverse order of movement then occurred. Through this fluid, coordinated movement of hands, arms, head, and body, the student researchers were unconsciously invoking dispositions from a different field within the research and science learning context (Fig. 1).

Figure 1. Randy and Ivory shared embodied dispositions of how to perform the wave dance. These verve and movement dispositions unconsciously emerged as the researchers engaged in activities to further their understandings of sound waves so as to develop the curriculum enhancer, “Sound in the City.”
Dispositions and structural resonances. By working with student researchers as curriculum developers, we were learning how to identify and begin to understand the significance and unconscious nature of two dispositions that were common to the researchers and have been widely observed in urban classrooms. Moreover, we were able to observe how particular structural conditions produce resonances in individuals and allow cultural capital such as verve and movement to unconsciously emerge. The subtleties of field structure became increasingly clear as we observed the student researchers within different spaces. Of particular interest was video footage of their time spent within a university lab interacting with undergraduate physics lab setups. During one portion of the day when Randy and Ivory were working together on a lab that involved an oscilloscope and a microphone, we were able to study, in additional depth, these same dispositions enacted in association with the science curriculum:

Rowhea: Randy was interested, right from the start, in the effects his own voice had on the wave patterns produced on the oscilloscope. He held the microphone to his mouth and imitated a car revving up and later hummed loudly. He also placed the microphone inside the part of the apparatus that consisted of a tube of air and moved it quickly back and forth and observed the monitor keenly. However, he soon gravitated towards Ivory’s headphones and CD player and picked them up. “This got a radio on here, Ivory?” For a while, Randy was satisfied with placing the microphone on top of the headphones and quietly watching the wave pattern on the oscilloscope screen. However, about 15 minutes later, lively music suddenly flooded the room when Randy decided to remove the earphones from the CD player to experiment further. That was when Ivory became involved. As if on cue, she stood and began to rap into the microphone, “kik, kik, kik, kik.” She moved her shoulders and feet to the beat of the music. Both she and Randy watched the monitor as she sang/rapped into the microphone in synchrony with the CD. Then, a section consisting only of “beats,” rather than lyrics, played and Ivory began to really dance—switching the microphone from hand to hand—as she moved in perfect rhythm to the fast beat.

Although there was a seemingly contrasting structure from the informal learning environment of the research space just a week earlier, utilizing microanalysis techniques, dispositions of verve and movement were emerging in this physics laboratory. Despite being different fields, there were common human and material resources, rule systems, and ideology that allowed “structural resonances” to arise and particular unconscious dispositions to be enacted. More specifically, three structural consistencies were evident: (1) human resources remained the same as Randy and Ivory worked together and had access to each other’s dispositions; (2) auditory resources corresponded, as lively music consisting of sections of “beats” was playing in each space; and (3) similar visual resources illustrated wave patterns and motion—the oscilloscope screen in the lab and the slinky in the research office. As a result, Randy and Ivory’s practices closely resembled those enacted previously, although difficult to identify while playing the videotape in real time. For example, facing the oscilloscope monitor, Ivory’s left arm began to move to the music in the shape of a wave—she arched it upward mimicking a crest and then nose-dived her fingers to signify movement; the wave passed through her body and then “appeared” in her other arm’s upward motion (Fig. 2).

The level of understandings that became possible regarding the teaching and learning of urban youth underwent marked growth as the student researchers helped us learn more about their unconscious practices and the structure of fields. With a research design that included student researchers within capacities that extended well beyond that of the traditional “member checker,” the result was a curriculum resource, which, in Ivory’s view, was “about urban science—how science is related to your everyday life. How you’re learning.” Shakeem further explained: “Basically learnin’ science before ya’ll, ya mean? So ya’ll can better understand how to do things
Ivory engaged in “battle” as she observed the oscilloscope screen showing sound wave patterns associated with the music she was playing aloud. Her arm and head movements were coordinated and resemble those that emerged while developing the “Sound in the City” movie.

Figure 2. Randy and Ivory engaging similar dispositions of verve and movement within a different field (university physics lab).

In ya’ll classroom.” As expressed by May, the movie was about “helping younger children to look at science in a different way.”

Implications for Urban Science Education

The very nature of the educational practice—its necessary directive nature, the objectives, the dreams that follow in the practice—do not allow education to be neutral as it is always political. . . . The question before us is to know what type of politics it is, in favor of whom and what, and against what and for whom it is realized. (Freire, 1993, p. 22)

Considering the political context of urban education with oppressive structures informing teaching and learning practices, we contend that, for research of urban settings to make a difference in the manner in which science is taught, we must engage a methodological approach that provides real voice to the primary stakeholders—our urban youth. In this study, we have shared how our involvement of student researchers, within a variety of research roles that extend beyond traditionally passive ones, has allowed for the formation of deeper meso-level understandings of the importance of respect in urban youths’ lives, and the ways in which practices and student identities, emerging from other fields, may impact their participation in science classrooms. In addition, we have been able to take micro looks at students learning science and have begun to recognize patterned practices that can then be identified as helping them as science learners. Moreover, we are now increasingly interested in understanding the structural components that allow resonance to occur such that particular dispositions associated with various identities are afforded in science classrooms.

These understandings have much to add to the current literature regarding urban science education. For instance, Delpit (2002) argued that there is a “culture of power” in schools that serves to privilege mainly white, middle-class students by allocating rewards to the students most familiar with its rules and norms. Findings from our research studies indicate the ease by which classroom-based practices communicate and further reinforce this culture of power, especially when teachers do not have insight into what gains or loses them respect with their students. Furthermore, viewing respect as a form of symbolic capital and recognizing the potential it carries for exchange into other forms of capital, such as science cultural capital, makes it a top priority for
teachers and administrators to form deep understandings of the practices that students engage to build respect. Hence, rather than enacting practices that may afford students’ disrespect, teachers may work with students to restructure curriculum and classroom activities to afford the building and exchange of symbolic capital (i.e., respect) in other ways. As shown here, the involvement of student researchers as curriculum developers has allowed us insights into other ways in which respect can be earned. Peers of the student researchers who have watched the student-produced sound movie, for example, remark excitedly and in awe of their counterparts whom are engaging in practices that are valued in the neighborhood and home (e.g., dance, rap, and verbal playin’) in conjunction with the doing of science. More often than not, the enactment of dispositions such as these position students to be “at odds with larger mainstream ideals” (Allen & Boykin, 1992, p. 589) rather than assisting the youth in the building of any forms of capital that will be useful in transforming their positions in social space. This is because, traditionally, in science classrooms, including those in urban settings, gaining symbolic capital with one’s teacher may be tied to engaging practices that reinforce the culture of power, especially as middle-class language and methods of argumentation are privileged in science classes (Lemke, 1990), rather than the enriching discursive and embodied dispositional resources (e.g., movement and verve) of youth. In fact, their cultural capital, knowledge, and dispositions are often not valued and teachers have difficulty designing a curriculum that recognizes, understands, and draws upon the resources of low-income and minority students. When dispositions are afforded, it is accidental, fleeting, or through a concerted effort of student(s), teacher, or both (e.g., Elmesky, 2003). The sense of exclusion that students therefore experience is compounded by cultural differences between them and their teachers, many of whom are white and middle class and may base their teaching practices on deficit views (Nieto, 2002). Recent urban science education research (e.g., LaVan, 2004; Wassell, 2004) has revealed that, when conscious techniques are engaged to afford the use of students’ capital within a science learning context to meet science-related goals, culturally congruent teaching arises, which is often unconscious, synchronous, fluid, and replete with positive emotional energy (Collins, 2004). Moreover, teachers and students are found to develop similar practices, experience high levels of positive emotional energy during interactions, and have a productive exchange of varying forms of capital.

If “science for all” is a goal for public education, our findings and a body of supporting literature indicate a real need for better understandings of how supportive, culturally fluid science learning communities can be formed within science classrooms to foster positive identities associated with science and greater accessibility of the subject matter. Moreover, our findings suggest that, with the assistance of urban youth, preservice and in-service teachers can come to understand the practices and structures that promote solidarity and a sense of community. Thus, science classrooms may be transformed from sites where the cultural capital of minority and low-income students are sometimes not valued or are actively discouraged and where students are often expected to wholly adopt the language and symbols associated with the dominant culture, to sites where students’ contributions are valued resources and successful interactions can enable new symbols associated with science to become invested with positive emotional energy.

Notes

The opinions, findings, conclusions, or recommendations expressed in this investigation are those of the authors and do not necessarily reflect the views of the National Science Foundation.

The first author is from a mixed racial background, yet has been enculturated to some extent with white, middle-class value systems. The second author is white.
May, Ivory, Shakeem, and Randal. They referred to our research group as DUS, or Discovering Urban Science.

Average length of time was 20 hours/week for 8 weeks.

A small learning community is often referred to as a school within a school.

All student researcher names are pseudonyms.

Eventually, Tyrone attended a charter school for at-risk students and in 1 year earned the credits to successfully graduate from high school.

Supported with a grant from the Spencer Foundation.

Dr. Gale Seiler who was a graduate student at the time, is credited with having the insight that Tyrone could benefit from reading these texts and use them in his roles as a student researcher.

On special occasions and for specific tasks, such as expert panels and transcribing, we hired numerous student researchers for short periods of time.

We continued to employ four of these students over the summers of 2002 and 2003 and brought all students back together for a weekend research session in spring of 2004.

We use the phrase new teacher rather than student teacher because of the roles they enact in urban high schools.

To create the movie, the youth had to learn how to operate a video camera, capture quality footage, import, edit, and sequence clips that had been converted from analog to digital format, as well as add titles, transitions, and sound effects. The researchers had access to a video-editing station, consisting of a computer with Inmovie software, a VCR and monitor, and an analog–digital converter.

“Battle” refers to instances when youth engage in competitions requiring movement and verve prowess. Often two youth, well versed in synchronous movement and sharing an embodied understanding of specific sets of dance moves, “perform” for other peers who may or may not choose to counter the performance with a performance of their own.

The metaphor of resonance was developed by Ken and Wolff-Michael Roth during the course of theoretical discussions in spring of 2002.

Intermediate between micro and macro; concerns unfolding events in actual (experienced) time.

References


