

Kobe's story: doing science as contested terrain

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Science education in poor, urban settings in the U.S. is fraught with inequalities in terms of resources, access of educative opportunities, and quality of science instruction. These inequalities are further exacerbated for homeless youth who must also deal with the daily realities of shelter living, transience, school transfers, and social stigmas. Responses to the challenges faced in urban science education have ranged from writing new science standards and holding students more accountable for the problems inherent in the schooling system to offering students vouchers to attend “better schools.” Absent in all of these responses is an attempt to understand the science experiences of youth living in urban poverty and how those experiences can help us to craft scientific practice and science education in more culturally situated, inclusive, and socially just ways. In this paper the author draws from a critical perspective to argue for the importance of understanding the doing of science as contested terrain as one way to better get to know and understand urban homeless youth and how we might work best with them in school science. To make this case an overview is first provided of the critical stance that frames the research presented in this manuscript. Following this overview, Kobe's story about science and life in the inner city is told. Then, using Kobe's story, a case is made for why doing science in poor urban settings is contested terrain and why this idea is a useful lens for making sense of youths' lives. Finally, the author concludes by discussing the implications of understanding both youth lives and science education as contested terrain for school science reform policies and practices in poor, urban settings.

Introduction

Kobe¹: Related to science, you know, I just don't like that lot that we have across the street 'cause, you know, it's all garbage and I don't know why they try to fix it up. It's gonna stay an empty lot. All that's gonna be there is the same junk there is now.

Steve: Um, Kobe, like, how come you don't get hope again? (Pause). Yeah.

Kobe: Because, I mean look at it. I mean, who's really gonna be here? Who's really gonna spend their time over there working and, and it's built on a sewer. I mean, not a sewer. (Pause). What do you call it –

Kobe: – (interrupting) A. (pause) a swamp. And all these rats. People have little children running around here, man. They could seriously get bit, or hurt you know. Excuse me.

Steve: Okay, Kobe. Got kinda touchy there, but see, I don't agree with you cause people might get hope in that lot. And they might build something good on there, so what's your thoughts.

- Kobe: But, you can't put, you can't build, well you can build, but you just can't build concrete, because, you know, it will collapse, and then the sewage stuff. (Pause). Stuff like that. So, all right. There you go.
- Steve: But we could do the garden or a playground or something –
- Kobe: – (interrupting) Now see, for order you to build a playground, you need concrete. You know? All right, how you expect the swings to stay on, to stay down into the dirt?
- Steve: On the spongy mats, you know –
- Kobe: – (interrupting) But I'm saying. Like I said, those you call the spongy mats, right? Well, one day I might you know. Well you know. It's like a bad neigh-, you know kids drive by you know, throwing things out they car. Bottles. It might hit the building and cut a kid. All right?
- Steve: You do got a point, but you know, we gonna build a fence around it. And like, we gonna have securities on it. –
- Kobe: – (interrupting) But, excuse me, like I said, they drive by and throw bottles and stuff like that, out their window. How is a security guard gonna stop them from doing that while they're just standing there? In a car, they're in a car. How are they gonna stop them? And you know, like I was saying, and what's that fence gonna do? They say, like a said, the fence could hit the build-, I mean the gate-, the bottle could hit the building behind the fence, and the fence doesn't stop glass from going through the little holes in the fence really. It doesn't really help, you know.
- Steve: Again, you got a point.

I begin this manuscript with an extended quote from a debate between two teenage boys, Kobe and Steve, who lived in a homeless shelter in an impoverished New York City neighborhood. This discussion took place during a group conversation when Steve, initially, was leading a discussion about the why or why not youth should get involved in doing science. At the time of this interview, Steve had been involved in an after-school science program focused on transforming an abandoned lot into a community garden. Kobe, however, had not, at this point, been involved in the lot project or any of the other after-school programs at the shelter. In fact, Kobe happened to be “listening in” on this interview and jumped into the conversation to debate the merits of the lot transformation project. Although not convinced by Steve about the merits of the lot, this conversation signaled his initial entrée into doing science in his community.

In reflecting on this debate, I am at once struck by the conflicted nature of why youth might engage in science in poor, urban communities. It is important to “get hope again,” yet it also important to be realistic. It is important to be responsive to the needs of children, yet it is important to keep the children safe from gangs and from rats. It is important to make something that will be strong and will last; yet it is important to protect what gets made. Accomplishing such a practice of science is no small undertaking given that these concerns have been voiced by youths whose lives are marked by poverty and whose daily activities are bounded by life in homeless shelters. Doing science in poor, urban settings is indeed a loaded endeavor and one that, if we pay close attention to it, might provide us with better insight into who urban homeless youth are and how we might work *with* them in school science settings.

Thus, in this paper I draw from a critical perspective to argue for the importance of understanding the doing of science as contested terrain as one way to better get to know urban homeless youth and how we might work best with them in school science. To make this case I first provide an overview of the critical stance which frames the research presented in this manuscript. Following this overview, I then tell Kobe's story about science and life in the inner city. I elected to tell Kobe's story, in particular, for three reasons. First, over the course of the 1998–99 school year I had gotten to know Kobe quite well. Second, Kobe's story is particularly challenging because of his struggles with academic success in school and because of the competing demands in his life. Third, over the course of the year that I knew Kobe, he underwent a change in his own thinking about the role and importance of science (both in and out of school), and his change was highly and positively influenced by his interactions with his peers at the shelter (i.e., Steve, from the transcript above). Then, using Kobe's story, I make a case for why doing science in poor urban settings is contested terrain and why this idea is a useful lens for making sense of youths' lives. Finally, I conclude by discussing the implications of understanding both youth lives and science education as contested terrain for school science reform policies and practices.

Science for all?

Thus, the challenges of urban science education are layered and these layers are deeply connected to each other and to issues of power and control. Yet, a summative review of the urban science education literature, including the recent reform initiatives (herein referred to as Science for All, or SFA), demonstrates that the needs of homeless children have not been addressed, and the most closely related literature (the needs of high-poverty children) is addressed only in terms of what they *lack*. Studies have been framed around high poverty urban science students' low attitudes in science (Atwater, 1996), low achievement levels, and lack of exposure to high-quality curricula, materials, programs or teachers (Darling Hammond, 1999; Ingersoll, 1999; Oakes, 1990, 2000; Page 1989, 1990).

The science reform efforts which mark the past 15 years of science education, supported by both the National Research Council (NRC, 1996) and the American Association for the Advancement of Science (AAAS, 1989) have attempted to confront these issues that divide. Because of its egalitarian stance, the SFA reform efforts have been hailed by science education researchers as crucial to those groups of people who have been underrepresented in the sciences, including women, racial, ethnic and language minorities, and students in high-poverty situations. As the major reform-based policy statements have announced:

All students, regardless of gender, cultural or ethnic background, physical or learning disabilities, aspiration, or interest and motivation in science, should have the opportunity in science, should have the opportunity to attain higher levels of scientific literacy than they currently do. This is a principle of equity . . . and has implications for program design and the education system . . . to ensure that the standards do not exacerbate the differences . . . that currently exist. (NRC, 1996, pp. 6–7)

When demographic realities, national needs, and democratic values are taken into account, it becomes clear that the nation can no longer ignore the science education of any students. Race, language, sex, or economic circumstances must no longer be permitted to be factors in determining who does and who does not receive a good education in science, mathematics and technology. (AAAS, 1990, p. 214)

Yet, SFA has been criticized, and I believe rightly so, for continuing to view the needs of poor, urban youth through a deficit model (Calabrese Barton & Osborne, 2001). A deficit framework emerges in SFA in three distinct ways. First, SFA assumes that children and youth who come to school not versed in the culture of Western science are “lacking” and need to engage in extra efforts to catch up to their peers. Second, SFA assumes that students will choose to adopt these Western science values for their own while at the same time showing theirs as inconsistent and (implicitly) inferior with that of Western science. If or when students do not assume these values, it is assumed that they are at fault, *not* the instruction or the content of instruction. Finally it is assumed that schools operate meritocratically: that science achievement scores are based on one’s efforts and abilities rather than one’s degree of enculturation into a system. Specifically, it seems to me as a teacher and researcher in high-poverty, urban settings that the science for all campaign fails to provide a useful paradigm for understanding the science education needs and experiences of youth living in urban poverty. Indeed, the national science education reform initiative, “Project 2061,” states that “teachers should . . . make it clear to female and minority students that they are expected to study the same subjects at the same level as everyone else and to perform as well” (AAAS, 1989, p. 151). This message implies that minority students and females need to work and act like their white male counterparts. Although it can be argued that this is a call for teachers to engage all students, not just the white middle-class males, in the academic rigors of science, it can also be read as a call for teachers to encourage, if not require, acculturation. In the very effort to create inclusive science education communities, policy, practice, and curriculum become connected in the politics of assimilation with schools.

Despite this critique, I agree with many researchers in science education that SFA is both a moral and ethical imperative. The current system must be revamped to better reach poor, urban children. My disagreements, from a critical perspective, rest in how the issues get framed and the import this has for how we understand youth lives and how a practice of science (might) authentically emerge from them. Thus, in the remainder of this paper, when I use the phrase science or science education, I refer specifically to a critical science education perspective, unless otherwise stated.

I use the phrase a “critical approach to science education” to suggest a blending of critical and feminist theories which recognizes that education is “fundamentally concerned with understanding the relationship between power and knowledge” (McLaren, 1989, p. 183). This perspective rests on the following three major understandings:

1. that knowledge is grounded in a social constructivist epistemology, which assumes that an individual’s or group’s knowledge of the world is always subjective and contextually mediated (Eisenhart, Finkel, & Marion, 1996);

2. that an understanding of power is grounded in the recognition of the explicitly political nature of education, which argues that schooling “must be fundamentally tied to a struggle for a qualitatively better life for all through the construction of a society based on nonexploitative relations and social justice” (McLaren, 1989, p. 172). Viewing the sciences from a critical standpoint refutes the positivist myth that there is an objective, solitary way of doing science and that “the universalist ideal of a disinterested, detached, objective observer who is free from the limitations of a standpoint . . . has led to a dangerous arrogance regarding the status of scientific knowledge” in Western society (Stanley & Brickhouse, 1995, p. 392). One result of this “dangerous arrogance” is the marginalization, even the destruction, of knowledge systems and ways of knowing considered to be inferior by Western science standards;
3. that schools are social institutions, which are generally focused on more than achievement in learning academic subject matter. Rather, the goals of schooling often center on students learning obedience and how to comply with cultural norms and expectations, especially in poorer, urban settings (Oakes, 1990; Page, 1990). For example, success in science class is often more about being good at doing school (i.e., knowing the rules for participation and expectations of a “good student”), than doing science (Lave & Wenger, 1991). Furthermore, the cultural norms, expectations, and rules for participation which are (explicitly and implicitly) brought to the fore and valued in education reflect the social, cultural, economic, and political reality of the culture of power, to the exclusion of other possible realities. In summary, a critical approach offers a foundation for challenging the traditionally held assumptions underlying science education. Indeed, the very belief that students and teachers co-construct knowledge within a politics of location and identity suggests that knowing – knowing science, knowing education, knowing ourselves, knowing others – is historically and politically contextual, and also changeable.

In what follows I use this critical science lens to make sense of Kobe’s science story.

Recasting urban science education through Kobe’s story

I present my telling of Kobe’s story in three parts. First, I provide an overview of the methods that framed the construction of the story. Second, I share a detailed account of the setting and context where Kobe lived during the time that the data for this story were generated. Third, I present Kobe’s story of science and life both in and out of school.

Learning at Southside Shelter

I² have been teaching and researching with homeless youth in urban settings for the past several years. During the 1998–99 school year my research team³ and I worked specifically with teens at Southside Shelter, a shelter in an impoverished NYC neighborhood, on action-research-based activities ranging from community garden-

ing to a video production of life and science in the inner city. The objectives of this action research were threefold: (1) to work with the youth to articulate their concerns and the concerns of young people today; (2) to involve the youth in the practice of science, including such things as defining then asking good researchable questions, seeking out and using meaningful resources, generating and collecting data and deciding how and when to use those data, and using basic scientific skills such as observation, calculation, mapping, classification, data collection and analysis; and (3) to bring different people together to share ideas, experiences, and knowledge bases to learn across our differences about how experiences, cultures, and understandings shape how and why we become users and producers of science as well as the knowledge and products we generated. Thus, the working definition of “doing science” in this after-school program emerged from a critical science perspective: for youth, through shared discourse, experiences, and systemic inquiry, data collection and analysis, to critically understand, analyze and act upon or transform the natural world surrounding them.⁴ At least 40 children and teenagers were involved in at least one project activity with about two-thirds of the participants being boys. The participants were predominantly African-American, Caribbean-American, and Latino. For the majority of the teens, including Kobe, this was their first experience as a homeless person. Kobe became involved in several of the projects towards the spring of the 1998–99 school year.

The methodology I employed was critical ethnography (Carspecken, 1996; Lather, 1991; Villenas, 1996). In particular, data for Kobe’s story were generated in several ways. I got to know Kobe in the early winter of 1999 while hanging out with other youth at the shelter who were involved in the after-school science program. At that time Kobe had not been actively participating in the program but he did often hang out with youth who were involved. After casually getting to know Kobe, I conducted a series of interviews with him. He also participated in a series of interviews conducted by other teens for this project. Although the interviews were framed as conversations, the interviewer followed a general interview protocol covering the following main topics: Science in and out of school, the scientific community, and science and life in homeless shelters. All interviews were audiotaped or videotaped. I also generated participant observer field notes and reflections of his participation in the after-school program (once he began to participate) and generated field notes from day-to-day informal conversations with him and his peers. Finally, I generated a complete transcript of a video documentary (*The Urban Atmosphere*) co-produced by Kobe⁵ as an outgrowth of our “hanging out” sessions. Creating the video was the youths’ idea and its purpose was to document science and life in the inner city. All data sources were transcribed and entered into a qualitative computer program for coding purposes (QSR NUD*IST). I used a process of grounded theory development (Glaser & Strauss, 1967) with the development of specific categories and types being an evolving and iterative process. I used both open coding and axial coding to accomplish this task (Glaser & Strauss, 1967; Strauss, 1987).

Life at Southside Shelter in New York City

Although family homelessness has been a part of New York City’s landscape since the city was founded, it was not recognized as a public issue until the 1980s (Beard,

1987). Data generated across the 1990s reveal that over 90% of all homeless families were headed by females, the majority of whom were under the age of 25, and black or Latina (Nunez, 1996). Children from homeless families constitute two-thirds of all homeless individuals and disproportionately suffer from a lack of adequate health care, educational deprivation, social stigma, and weak social circles. They also develop chronic respiratory infections, gastrointestinal diseases, ear disorders, and dermatological problems at a rate double that of “homed”⁶ poor urban children (National Center for Health Statistics, 1995).

Conservative public and social policies⁷ have not met the needs of homeless families and, in fact, have contributed to the increase in the number of homeless families in New York City and nationwide almost tenfold (Nunez, 1996). Cuts in federal and state assistance to the poor have destabilized families such that the historically one-time housing emergencies no longer constitute the primary cause of family homelessness (Nunez, 1996). According to Nunez (1996) systematic reductions in programs that serve the urban poor led to the “notching down” of an entire generation into a chronic and debilitating poverty that claims homelessness as one of its most defining characteristics.

Southside Shelter, built in 1997, is a relatively new family homeless shelter in the Top Hill neighborhood of New York City. Top Hill is home mainly to Black and Latino/a populations, many of whom are recent immigrants to the U.S. (documented and undocumented) from places like the Dominican Republic, the West Indies, Mexico, and Africa. There is also a significant Puerto Rican population, as well as a multigenerational Black population.

Top Hill has gone through many changes. Since the late 1800s Top Hill has been home to many different immigrant populations: Irish, Jewish, Italian, Russian, African, and Caribbean. As each ethnic group made its way into U.S. culture, its members moved from Top Hill to more affluent suburbs such as Long Island, New Jersey, and the northern Bronx. However, in the 1970s these dynamics changed. Many of the Black families chose to stay in the neighborhood, in part because they were not as welcome in the more traditional “stepping stone” communities as other, white ethnic groups were; in part because their economic successes had not mirrored those of the previous (white) ethnic groups to inhabit Top Hill. Consequently, many turf wars now take place in Top Hill between recent immigrants and the multigenerational Black residents. There are also turf wars amongst the highly diverse Latino/a populations with Puerto Rican and Dominican Republic families often claiming dominance over those from their poorer Central American neighbors such as El Salvador, Guatemala, and Nicaragua.

As these turf wars suggest, Top Hill is a tough place to live. The reputation of this neighborhood has been depicted in a negative manner by the local and national media, and the residents of the other parts of this city often refer to this neighborhood as undesirable and dangerous. Yet, after having experienced economic decline in the 1970s and 1980s, Top Hill is just beginning to recover. There are several bodegas, check-cashing stores, and fast-food restaurants lining the streets. The neighborhood is mainly home to towering residential apartments and a large comprehensive high school; however, some boarded-up buildings and abandoned lots still remain.

Southside Shelter is one of the largest family shelters in the city. It is sandwiched between one of the larger comprehensive high schools, which has had the

reputation of ranking below average in standardized test scores, and a city park known for its violence. Southside is different from many other shelters in the city because it serves all kinds of families whereas many of the family shelters in the city are strictly earmarked for domestic abuse, drug-related homelessness, or people living with HIV. Southside is run by a private organization, which receives private and public funding to sustain its operations in order to serve people displaced from their permanent residences. The founders of Southside pride themselves on their commitment to “living for today and building for tomorrow.” They believe their multifaceted approach to homeless families (education/job training, housing, and counseling) will help their families assimilate more easily and more quickly into a “self-sufficient society.”

The shelter itself is well kept and simultaneously resembles a motor lodge that one might see on an interstate freeway or a prison (depending on perspective). It is a two-winged, four-storey complex painted in a burnt orange hue and has a playground for young children. The whole complex is fenced off from the rest of the neighborhood with a large black metal fence on all four sides. The buildings that house the residents are constructed out of cinder block. Some residents have complained that this structure leaves them cold in the winter and able to hear their neighbors. On entering a unit, one can clearly make out the cinder block design up the walls. Each unit has a kitchenette, bathroom, living room area and bedroom area; however, there are no formal dividing partitions for these areas. This shelter also serves as a working facility with administrative offices, recreation rooms, a computer room, a conference room, maintenance department, daycare, and preschool programs for children. There are on-site social workers, counselors, GED programs, school-age children’s programs, and city administrators.

The shelter is also highly regulated. On entering the shelter through the front gate (the only entrance) there are two security guards and a check-in desk. All visitors for any nature of business or personal reasons must sign in and out at the front desk and show picture identification before being allowed to enter the premises. Adult residents may not stay out past 10:00 p.m., teenage children may not “hang out” around the building, and young children cannot run around unless in the playground supervised by adults or preschool workers. Residents may not have guests, even if these guests are family members such as mothers, grandmothers, children, or friends. Infractions of these rules along with violations of drug use, domestic violence, child abuse, or any other criminal activity results in immediate eviction or discharge from the facility. Personal adornments to the individual units are also discouraged. Shelter directors want the residents to remember this place is not home.

Many of the youth who live at Southside feel that the shelter rules along with its physical construction give the shelter a prison-like or cage-like feel. Kobe often described the shelter as feeling like “a jail.” His peers agreed with his assessment and added that it made you “feel like you locked in a cage” (Shorty, female, age 14). Kobe also described the worst aspects of living at Southside are that the youths have curfews, they have to deal with security guards on daily basis, and they have no privacy. Indeed, Kobe wished that, at the very least, the shelter would add “doors” and “some private spaces” within the unit. Finally, Kobe, as with the majority of his peers, was embarrassed to have his friends find out that he lived at Southside Shelter:

I don't like [my high school] because, you know, it's too close to home. And the friends I might make there might live around the way, which they sure enough do, they might laugh at where I live. But see, and another reason because, I wouldn't wanna go there because, if they call home, my mom could just walk right in. I like being in far distant schools. Where my mother doesn't know the way, or doesn't know how to get there, or the, probably even the name. So, that's why I don't like my high school, because I live right across the street from it.

Locating and keeping space at Southside is also riddled with bureaucratic red tape and games of chance for the youth and their families. In the transcript segment below, one of Kobe's better friends (Darkside) described these games of chance and the dehumanizing process his family endured in their struggle to gain access to the city shelter system:

When I was in the 7th grade, my father paid the rent, but the landlord didn't take rent. He said the check was bad. But, he didn't give us any warning. Instead the sheriff came to our apartment in the middle of the night. He told us we had 24 hours to vacate the apartment. That is when they also told us the check was bad. We didn't have anywhere to go. My mother and father took us to the EAU [Emergency Assistance Unit]. The EAU, they put us in a smelly, dirty, rotten place where we stayed for 10 days. After that they deemed us ineligible, reason being that my parents only have a "common law marriage." What I mean by that is they were never married by law. They lived together for 15 years. They had three children together, but they was never married by the law. My parents applied again at the EAU for housing. This time we stayed another 10 days at the same rotten place before they told us we were ineligible. My parents, they got some money and paid to get married. They went to the EAU and they put us in a shelter. I never went to school during that time, until we got into a shelter. I never really made such an understanding, but I can see now that my grades were bottom in the 7th grade.

Thus, the process of securing and maintaining homeless housing is dehumanizing and makes attendance at school or work nearly impossible. Youth like Kobe are moved around the city in a process that takes up to 2 weeks if the family is lucky enough to be deemed eligible on their first try. Youth and their families must follow strict regulations regarding behavior and curfew not required by the more affluent segments of society. Yet, Kobe and many of his peers recognized the double bind of this situation: He was indeed grateful for the space, yet he also recognized that people who worked at the shelters were trapped into following the same rules and regulations that made life difficult.

Kobe's story: the contradictions of doing science in and out of school

Kobe was a tall and handsome dark-skinned "sixteen-going-on seventeen"-year-old African-American. He walked with a pronounced swagger characteristic of many of his peers and he exuded a cool confidence. During the time I worked with Kobe, he carefully burnt a gang identity symbol into the top of his left hand that he often hid inside his oversized Starter jacket.

Kobe lived at Southside Shelter in New York City with his mother, one-year-old sister, and two-year-old and nine-year-old brothers. His only older brother was “in jail down south.” He couldn’t wait to grow up and move out on his own because he wanted privacy and personal time. This was not surprising given that Kobe often had primary child care responsibilities for his siblings. Kobe’s mother, for various reasons, would “sneak out” of the shelter for days at a time leaving Kobe to care for his siblings. When this happened Kobe made sure his siblings were fed and in bed at a reasonable hour, although he was not so intent on making sure his nine-year-old brother got to school.

Kobe was an incredibly private – but not shy – young man. He talked a great deal about sports, music, and clubs but rarely let me, or others, into his private life. In fact, I had known Kobe for over 2 months before I found out he was the primary care giver for his siblings – and when I did find out it was by accident. He had missed a scheduled meeting with me and so I had gone up to his unit to see to see if he was home and still interested in meeting. He stuck his head out of the door, keeping both the door and his body as a defense against me entering or seeing inside his unit, and asked if I could meet later in the afternoon. When I returned an hour later, I found him in the kitchen with a loaf of bread in one hand, a baby on one hip, and another young child sitting on the bed in the kitchen crying. It was then that I learned about his mother’s frequent absence and his responsibility for his siblings.

Kobe’s deep level of commitment to those around him was evident in other ways as well. He was committed to his gang, serving often as their “eyes” in various kinds of exchanges. He was also committed to his close personal friends. He could often be found in a particularly close friend’s unit talking with her or out in the courtyard watching her son. By his own admission, Kobe also had a difficult time with drugs; he was often high on pot or crack.

Kobe left school in the early fall of his sophomore year, although he did not officially drop out of school. Schooling was difficult at best – he found school boring and had developed an adversarial relationship with several of his teachers:

Well really, my science teacher, the row that I’m in, and some of the girls, and some of the kids, you know, they think they run things up in there. So, and what else. It’s like, you know, I hate it that I don’t do my work. Because, oh yeah, my teacher, I hate her. Last year, she failed me because I was gonna pass her class with a 65, she failed me because I said, “If you bring your Lexus to school, I’ll stab your tires.”

According to Kobe, school did not matter anyway because he planned a future in sports, and he preferred to play on a community team to his school team: “I’m smart, I’m real smart. They just think cause I always slack around and play too much, you know, and get high and drunk. No. I don’t play [basketball] for my school, because you know, my school is, how do you say, *garbage* (drawn out and exaggerated).”

He picked the pseudonym, Kobe, for himself because of the basketball star, Kobe Bryant. He planned to make it big in basketball, but if basketball did not work out he was willing to try football and even baseball. If sports in general did not work out, Kobe wanted to become a chef:

[What I want from life is] Basically as everyone, grow and die, but be rich and have grandkids. Lots and lots of grandkids. But, you know, I wanna become an NBA star or an NFL star. If that doesn't work, I don't want to try it, but if I have to baseball, cause I'm real good. But, I don't like it. I mean I like it though and, you know, what else? Um, what else do I wanna do? And a job, and if that doesn't work out, the athlete's thing, become a cook, a chef, cause I can really cook. But this is my interview. But I wanna be a cook, 'cause I can cook. I can throw down in the kitchen, but you know what about it is? I just don't like cleaning up the mess.

Although Kobe had not been attending school, he did participate in the after-school science program at Southside Shelter. His participation was slow at first. While many of Kobe's peers at the shelter were involved in an action science project of transforming a local abandoned lot into a community garden, Kobe only watched from a distance, often ridiculing his peers about wasting their efforts on a project that would never succeed. Several months into the project, I began to interview the teens about their experiences transforming the lot. Kobe often came to these interviews (at the invitation of his friends), listening in from the side, and eventually expressing an interest in being interviewed and in designing and conducting interviews. I immediately responded to his interest because I wanted to involve Kobe in ways that were meaningful to him. He had not participated in the project thus far, and most of his conversation had focused on why the lot transformation would be unsuccessful. Because participation in the "research" aspect of the project (the interviews) required parental consent, I went with Kobe to his unit to talk to his mother about his participation on the project. On the way to his unit, Kobe asked me if he could carry the camera. When I told him that was fine, we shared the following exchange:

Kobe: How do you know I won't break it? Or steal it?
 Angie: I don't.
 Kobe: How do you know I won't hurt you?
 Angie: I don't. How do you know I won't hurt you?
 Kobe: I don't.

Although this conversation transpired nearly 3 years ago, it still feels to me as if it were yesterday. So much was embedded in this short exchange over the camera. On the one hand, Kobe towered at least an entire foot over me. His figure was lanky, as is true for many tall teenage boys, but he was athletically fit and physically aggressive. On the other hand, as an educated middle-class white woman, I carried with me the capital of being white in America.

The interviews drew Kobe into an ongoing debate with his peers about the purposes, goals, and importance of the lot transformation project. He took these interviews rather seriously, challenging his peers to support their claims about the importance of the lot transformation project, as the conversation which opened this paper suggested.

Kobe's participation in the interviews slowly introduced him to the other youths' involvement in the science action project, and, as a consequence, his participation spread to other aspects of the project. He became one of three co-producers/co-directors of a video made by teens for teens about life and science in

the inner city (*The Urban Atmosphere*). He also began to participate in the garden project through “community days” or “all day Saturdays” when the entire shelter community was invited to help out with the lot project. I could not help but notice how working on the video production of the garden led to his participation in community days. Returning to his earlier statements, Kobe believed that participation was a waste of time; that any efforts on the project would be wasted because of vandalism and rats. Yet, when he witnessed the success of his peers in actually transforming the lot through his filming of the project, he began to participate in community days. He described these experiences fondly and linked much of his participation to having fun while doing activities useful for the local community: “A community garden is good. We’re growing vegetables for us to eat.” And, “[The lot] lookin’ better than it used to. I was video tapin’, bringing out the cement and stuff. We was eating. We had a grill. We was eating hamburgers and stuff. It was a party while we worked.”

Kobe’s participation in the after-school science project (as an interviewer, filmmaker, and garden helper) seemed to have an impact on him. In the late spring, Kobe came to the decision that he would go back to school on the days he could. He hoped he might salvage something from his sophomore year, and he decided if sports did not work out, he might have science as a back-up career. Kobe reported his experience of returning to school to me with harsh language and deep emotion. As his story goes, the first class he returned to was science. He felt he “learned a little with the lot project” and thought this would be the “place” to go back. However, when he entered his class, his teacher asked him who he was in front of the rest of the students. When he stated his name and how he had been enrolled in the course, the teacher said he didn’t remember him, laughed, and informed him it was a too late for him to try to pass the semester. Kobe left school after class and did not return for the rest of the school year. As he later stated to me: “I was going to have science as a back-up career, but now, no. No. I try to do the right thing and go back to school, and what do I get? Just the reason why I left. No respect.”

Science as contested terrain

Kobe’s story exposes the contradictions emergent in his own school and science lives. Kobe cared for his siblings, challenged his peers’ thinking, and engaged in scientific practice in his local community. Yet Kobe also skipped months and months of school science, threatened his teacher physically, and experienced a level of harassment in school that ultimately fueled his decision to leave school altogether. These contradictions, I believe, help to expose the powerful ways we can learn from homeless youth about how science is contested terrain. What I mean by “science as contested terrain” is that Kobe’s story challenges us to conceptualize and practice science differently from how it is practiced in schools or constructed in popular culture. Science is not the neat package of ideas or theories youth learn in school. It is not even the carefully crafted debates that youth might have in more progressive or reform-oriented science classes as they work through the history of theories around evolution or quantum mechanics. It is more complicated and personal than that. The doing of science, like life, is always unsettled and controversial. It is the contested nature of science – the challenges, the complexities, and the unsettled and controversial nature of the doing of science –

which help us to better understand youth lives more deeply and more significantly and the practice of science more sincerely. Kobe's story, in particular, focuses the contested nature of science through three lenses: purposes and goals of science, participation in science, and the space of science.

Perhaps most importantly, Kobe's story urges us to redefine the purposes and goals of science. Kobe's story shows us how the focus of science is on "doing" rather than on science as a subject. Doing science – for himself, for family or friends, or for the community – involves *how* and *why* Kobe constructs explanations and solutions for the world around him more so than being about the scientific ideas he pulls from to make those explanations or solutions. The doing of science underscores how science is a dynamic enterprise and one important way in which Kobe's life becomes part of science is through his active participation in it. Kobe also challenges us to acknowledge how doing science is linked to the role and importance of locally purposeful science. Science, for Kobe, was based, in part, on engaging in utilitarian and pragmatic activities. By utilitarian I mean participation (and the science produced) is of some practical purpose. By pragmatic I mean that these practical applications and uses of science have something to do with the affairs in Kobe's community.

For example, in the transcript segment that opened this manuscript, Steve and Kobe debated the importance of participating in a science community. Steve used the opportunity to try to convince Kobe that participation would make important, powerful, and worthwhile contributions to a group of people larger than themselves. In that transcript segment, Kobe presented three arguments to Steve for not participating in the lot: it was full of garbage and would stay an empty lot; one could not build because it was a swamp full of rats and sewage; and kids would vandalize it. Each time Kobe presented a new difficult scenario, Steve responded with a reason as to why this lot project would succeed and why it was important to contribute. It is interesting to note how this argument came back to influence Kobe in powerful ways. Later with his work on *The Urban Atmosphere*, Kobe was keen to point out how subsequent efforts on the lot project focused on just the things he critiqued initially. He described his involvement in community days through his participation in activities that were realistic – that kids had actually accomplished – but that were also thoughtfully crafted around the needs of the younger people in the community. He helped fix a broken fence. He helped to plant vegetables that community members could care for and eat. He helped the younger children know what was safe to clean up and what should be left for others to deal with (i.e., rat droppings, drug paraphernalia).

This pragmatic and utilitarian dimension of doing science is loaded with political overtones for Kobe: science ought to be about the transformation of one's world or circumstances. Although Kobe acknowledged that this transformative agenda of science was not required for science to occur, it ought to be an important and highly desired quality, especially in poor, urban settings. In a conversation not described earlier, Kobe told me about how he wanted to add a basketball court in the garden but that it would not be science because it was "sports." However, later he teased out "the basketball court," from "the building of the basketball court." Here, he viewed the practice of building a basketball court as a scientific practice. What is interesting here is that the actual product – the basketball court – was sports. The act of the building of it was science. Further, Kobe and his peers had interviewed several local teens who expressed interest in a basketball court. Kobe

felt that finding this out and responding to it in thoughtfully planned ways also made this work science.

Kobe's story also pushes us to consider the issue of involvement and how we must recast our understanding of what it means to be involved in science. The importance of inclusion of all people emerged as central to Kobe's ideas and practice. Kobe considered his involvement in the making of *The Urban Atmosphere* to be an exercise in science. In the making of *The Urban Atmosphere*, Kobe sought to include a variety of youth in the project who were otherwise uninvolved in the lot-transformation project. The video project itself was designed to teach other youth about life and science in the inner city so that they could do a lot project in other communities, too. Working with two other teens, Kobe cast his net broad in creating *The Urban Atmosphere*, ultimately involving (in addition to those already involved in the lot project) five additional teens and one security guard in the video project. Although Kobe felt that the shelter had him "locked in a cage" with all of its rules and regulations and that his science teacher at school was out to get him, he used the garden project to help himself and his peers work around and resist these limiting qualities of his community. Even more interesting was his willingness to share this video with his science class at school. Although, in the end, he never did share the video because he felt too harassed to stay at school, the initial decision to do so is a powerful statement about inclusion. Furthermore, the video project itself, as a kind of participation in science, most powerfully influenced Kobe's ideas about science, his participation in scientific activities, and his understanding of the role and importance of school science.

Kobe's ideas about inclusiveness were also linked to his sense of responsibility. Kobe believed that most people should be involved if they participated in ways that were helpful to that community. This perspective was also supported by the negative experiences Kobe had with the other communities in which he participated. Indeed, Kobe described suffocating experiences in his participation in shelter communities and school communities situated in a more hierarchical model. Kobe described the homeless shelter community where he lived through the language of rules, regulations, and punishments. His descriptions of schooling were similarly laced with demoralizing experiences. These kinds of hierarchical communities Kobe experienced at the shelter resulted in him not feeling a part of the community where he lived. In fact, the non-inclusive model appeared to further alienate Kobe from where he lived by serving as a constant reminder of his status as a homeless individual.

Thus, Kobe's ideas suggested that a responsiveness to people's needs, accessibility to all, and input from all were essential features regarding who can do science. Participation ought to be open to all as long as participation is linked with responsiveness to the needs of the community as well as personal responsibility for engaging in productive behavior.

Kobe's views about participation in science are even more interesting when contrasted with his science education experiences in schools. Even though Kobe did not view school science as being connected to his own life, he did describe science as important to learn in school because it might help him have a back-up career in science. Kobe described school science as a place to learn science facts, but that he did not even get to do that because the school science was boring, his teachers were mean, and all they cared about in school was whether or not he showed up and quietly worked on his assignments.

Embedded in this discussion of the purposes and goals of science and participation in science are claims about how space matters: Where science gets done (in his neighborhood) and who has access to that space. This idea of doing science is situated within Kobe's social context. Doing science is premised on doing something for someone. From this perspective, context is critical. In both formal and informal conversations with Kobe space always seemed to lurk in the background of our talk. For example, in one particular conversation, Kobe's point was that "where" the science resides has implications for who is a part of it, and what one must know or be able to do to become a part of it.

Kobe's ideas about space challenge school-based science, which is often presented as if it transpired in a vacuum. Kobe's story pushes on social constructivists' and cognitive psychologists' views about the doing of science. Space is important for reasons more intimate than the importance of the situated nature of science. Though understanding how science is situated is important for understanding the values and beliefs embedded in how and why one does science, it seems that Kobe is arguing for something more personal. Space matters because space defines the science, defines who does or can do the science, and impacts in ways not talked about or measured by society how it influences and transforms. Science done in the inner city is done by and for those who live there. The practice of science that transpired at the shelter not only was embedded with the youths' ideas and concerns there, but also influenced Kobe as a person and transformed his community.

Lessons from contested science

Kobe's experiences give witness to the disjunctures that are a daily part of life and science in the inner city. From a science education standpoint, Kobe's life begs the question, *what does it mean to create a science for all* (see AAAS, 1989, 1993; NRC, 1997; NSTA, 1998)? In science education policy and practice circles, this continues to be a dangerous question. Science for all has been accepted and promoted in unproblematic terms. Science *is* the canon passed on from generation (of white middle- and upper-class male researchers) to generation (of white-middle and upper-class male researchers). It *is* the strict canon laid out in the national standards, prescribed by grade and topic. Science *is not* intuitive knowledge held by mothers, the day-to-day knowledge of how to survive life in the inner city, or the everyday experiences brought to school by many urban youth. It is not even the actions that youth take to transform their lives and life circumstances. Although the "all" in "science for all" refers in a physical sense to anyone who enters the doors of public education, in reality the "all" only includes those willing to trade in their identity for one that accepts and adopts the canon as their own. In other words, in current reform efforts neither science nor equity has been problematized or critically understood within the larger sociopolitical terrain of urban life.

Kobe shows us that science for all is problematic. It is problematic in terms of how science gets defined and by whom, and by how "all" in science for all gets constituted. Thus, Kobe's story points toward two major implications.

First, science educators must understand the landscape in which science education occurs as contested. The landscape is not just simply a location such as a classroom or a Boys' and Girls' club, but rather it is "geopolitical vectors of power"

which “crosscut the cultural terrain under investigation” including questions about not just the spaces where science gets done but also the lives of those who do the science, the science itself, and the cultural and political terrain in which such events occur (McLaren, 1992, p. 79). Second, science educators must understand and give witness to the disjunctures of the realities of urban homeless youth, which transpire in contested landscapes, and use these points of contestation to construct empowering science education and science education research. This seems imperative if we are really interested in constructing socially just and politically empowering visions of science for all, especially for those for whom science and schooling have been most unjust.

What does this mean, to view the landscape in science education as contested, or to understand and give witness to the disjunctures of the realities of urban homeless youth, and then before using these points of contestation to construct empowering science education and science education research? Critical and feminist educators remind us that research and teaching are neither monadic nor harmonious, but rather filled with contradictions and power struggles (Banks, 1999; Ellsworth, 1997; Lather, 1991; McLaren, 1992; Trueba, 1999). Understanding the landscape of science as contested and filled with contradictions and power struggles is critical to making sense of just how much the science education community’s vision of science and who can do science must be expanded. Indeed, there were many competing agendas shaping Kobe’s life, ranging from conservative social policies and the regulations at Southside to schooling practices and life in their neighborhood, to name a few. All of these domains positioned Kobe and framed his experiences, questions, interests, and needs. Simultaneously, these domains also served as both physical and ideological constructs which Kobe resisted, acted against, and worked to dissolve.

Kobe’s responses to the competing agenda of the inner city (as both acting against and being positioned by) played out in the ways in which community-based science got constructed by him, in terms of how science *and* who can do science were defined. For example, Kobe played a role in defining the participation in science rules even when their rules contradicted those of authority. Kobe participated in deviant ways by negotiating his own framework for participation. He was not going to be controlled by artificial rules imposed by the shelter regarding who can and cannot do science. Kobe’s life positioned membership in their own scientific community through a responsiveness to people’s needs and multiple modes of accessibility rather than through some socially oppressive definition of who can participate or what that participation ought to look like. In other words, for Kobe, doing science was laced with a subtext of agency – as an individual he could act on his world rather than be acted upon (McLaren, 1994). This is different from school science where the focus is on the passive receipt of objective and abstracted facts and theories created by scientists in places with money, far away from the inner city. It is also different from shelter life where constant streams of regulation shape residents’ day-to-day experiences.

Conclusions

When we embrace the landscapes and disjunctures of Kobe’s life and its impact on how youth participated in science as well as the science they constructed, then we

may better understand how youths' lives problematize (and make *un*harmonious) for us in powerful ways key assumptions embedded with reform-based policy and practice in science education. Take for example the following three assumptions foundational to SFA reform initiatives.

The first assumption is that equity means uniformity (i.e., all students will be equal if they all learn the same science). The push to national standards and a one-science-fits-all mentality neglects how science is constructed in sociocultural contexts and is shaped by those who "do" science, including youth. Prescribing what, when, and how one must know science dismisses the socially positioned nature of knowledge and the primary political purposes behind becoming scientifically literate. Generating uniform understandings across grades, subjects, and individuals demotes the importance of scientific understandings and actions not part of the white Euro central core of science. It also camouflages the hegemonic political intent of such a definition of scientific literacy.

The second assumption is that science is objective and that scientific knowledge is neutral. That students might feel alienated, silenced, or even oppressed by scientific ideas is not a subject of concern of national standards unless it is framed within a discourse of deficiency. Science is viewed as objectively constructed and separate from ideology and worldview. Maintaining neutrality of ideas silences and marginalizes the reflexive interaction between the kinds of needs and experiences that generate scientific activity and the ideas such contexts give life to (whether it be the reception of grant money, the desire to transform a lot, or the transfer of a virulent disease).

The third assumption is that youth are passive recipients of knowledge and are not agents of change. Although "learning" is positioned as an active process within the reform initiatives (i.e., constructivist epistemologies), students are not viewed as agentic – as able to be the powerful political players that they are. This last point links back to the society's continual attempts to construct a discourse of helplessness around homeless individuals.

These assumptions about equity, scientific understandings, and one's own role in that process do not hold for Kobe, nor do they hold for many youth in urban settings. After all, Kobe transformed rules for participation in the community-based science project just so that he and others could participate in ways useful to them as well as to the project. Kobe also further transformed the mode of participation in the community-based project to turn science experiences based on hurt and betrayal into survival. Although Kobe's participation may not have changed what actually happened with the transformation of the lot, his leading participation on *The Urban Atmosphere* influenced how the project was documented, communicated, and thus understood by the world outside his neighborhood. Indeed, Kobe expressed his agency along with the situationally contingent, subjective, and political nature of knowledge (Harding, 1991).

Thus, deeply embedded in Kobe's story is the argument that the vision for scientific literacy, as outlined by the recent reform initiatives in science education (i.e., National Standards in Science Education), is restrictive because this vision stops short of three important ideals:

- that science is situated and therefore emergent from students' whole life experiences (not just those neatly mapped onto science);

- that science is ideologic, embracing the values and beliefs of those who create it;
- that the *doing* of science *is* contested terrain.

Thus, in this paper I have foregrounded the life of one young urban homeless African-American male to help illustrate this shift in emphasis from science education as a content-driven practice to science education as a youth-driven practice. What I am arguing is that we must consider the ways in which youths' lives inform this process through their location, values, beliefs and challenges, and that these qualities transform science and participation in science in ways not captured by science standards.

In the United States, current science reform efforts are built on visions of scientists, science, and the scientific community that are myths based on superhuman qualities and insular behaviors (McGinn & Roth, 1999). These visions are not tenable because scientific agendas are informed by a community greater than just scientists, and such a vision neglects the day-to-day practice, struggles, and meaning making of scientists and the situationally contingent understandings and agreements scientists construct. The youth in this research demonstrated how the knowledge we produce in science education research settings is ideologically structured. Youth can and do influence the domain of science and schooling and they are and can be shapers of policies, if only we listen.

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Notes

1. This name and all names of the youth, shelters, and neighborhoods are pseudonyms used to protect the identity of the participants. All youth in this study self-selected their pseudonyms. All youths' first choices for pseudonyms were accepted even when those names were questionable.

2. Analysis of social policies and experiences of the youth at Southside cannot occur without knowing who is doing the analysis and why. I am an academic science education researcher and activist (Villenas, 1996). In short, I was a "visitor" at Southside, required to wear the visitor badge in plain sight at all times. I began my work with homeless families as a result of my own experiences as a homeless individual. In 1995 I spent three summer months homeless with my partner and our dog. Like many homeless families we spent the initial weeks bouncing around from family to friends. We then "graduated" to living in our car. The experience left me reeling as I struggled to balance preparing to teach in the fall with finding adequate privacy, places to get clean, and places to sleep.

Despite the difficulties we faced while being homeless we recognized it could have been worse. Our cultural capital as educated white people offered us luxuries that made the daily struggle of living possible. We could enter fast-food establishments, go directly to the bathrooms to wash up, and rarely be harassed for using the bathrooms for these purposes. We also could hang out in the public library for hours on end during the hot summer months (there was an extreme heat wave that summer) without appearing suspicious. And, as a test of society's social norms, we even dared ourselves to go to a local university gym, enter without IDs and take showers. Sadly, the evidence mounted that our homeless lives were, indeed, privileged. Our experience unearthed a deep-seated and pervasive enactment of cultural practices built on racist and classist intentions that in our society and schools are treated as normal and natural. This set of experiences, specifically, let me to focus my own educational efforts in science education on the experiences of urban homeless youth and their families.

Southside Shelter was one of three shelters in New York City where I spent time teaching and researching from 1995 onwards. I began working with Southside in the spring of 1998 because they invited me to work with their staff on providing science-related resources and activities to the families

who resided there. They were also interested in “research” to better document the role and importance of the kinds of compensatory programs they offered to families. There are two events, in particular, which marked my own participation at the shelter that I believe are important to present here. First, after my second week at the shelter, I stopped wearing my identification badge after making my way past the security entrance. I did this as an act of resistance, as if my own whiteness didn't already set me apart from the shelter residents. After all, of the 212 families who lived at Southside, two were white. Yet, even though I stopped wearing this badge, I was often approached by adults at the shelter for information about WIC and other programs. Clearly my outsider status did not need to be identified with a badge.

Second, about two-thirds of the way through my first school year at Southside I learned that many of the youth with whom I met weekly believed me to be “Latina.” This issue arose one day when I was working on a paper co-authored with one of the youth there (see Calabrese Barton & Darkside, 2000). He was typing the title page and listed the authorship as Angela Martinez and Darkside. When I informed Darkside that my name was not Martinez, that it in fact was “Calabrese Barton” he was astounded. He got up and started informing the teens about my “real identity.” As it turns out, the youth were surprised because they said I “did not act or talk white.” While statements like “talking or acting white” were surprising on one hand, on the other hand they seemed appropriate. The youth were reacting to what their lived experiences have led them to believe, for instance, that there is a “white” way of talking and acting. Because I did not fit their understanding of acting and talking a certain way, they allowed me into their community to share and learn with them.

3. In particular, I would like to mention Dana Fusco and Courtney St. Prix who took the lead in planning the action research program with the youth.

4. See Fusco (2001) and Fusco and Calabrese Barton (2001) for a more in-depth discussion of the science projects engaged by the youths at the shelter.

5. Three teens, including Kobe, designed, scripted, and produced a 60-minute video about science and life in the inner city called *The Urban Atmosphere*. In producing this video the youth selected several scenes they wanted to film (local fast-food restaurant, local bodega, a unit at the shelter, etc.). They also located 12 people to interview on their views on life and science in the inner city. These interviews are interspersed with commentary and the views of the neighborhood by the youth.

6. I use this word to refer to nonhomeless.

7. These policies include such things as slashed public assistance, reduced food stamps, cuts in housing assistance, denied Earned Income Tax Credits, and cuts in welfare spending.

References

- American Association for the Advancement of Science. (1989). *Science for all Americans*. Washington, DC: American Association for the Advancement of Science Press.
- American Association for the Advancement of Science. (1993). *Benchmarks for scientific literacy*. New York: Oxford University Press.
- Anyon, J. (1997). *Ghetto schooling*. New York: Teachers College Press.
- Atwater, M. (1996). Social constructivism: Infusion into the multicultural science education research agenda. *Journal of Research in Science Teaching*, 33(8), 821–838.
- Banks, J. (1999). *An introduction to multicultural education*. Boston: Allyn and Bacon.
- Beane, D.B. (1988). *Mathematics and science: Critical filters for the future of minority students*. Washington, DC: Mid-Atlantic Center for Race Equity.
- Beard, R. (1987). *On being homeless: historical perspectives*. New York, NY: Museum of the City of New York.
- Calabrese Barton, A. (1998). Science education and the politics of poverty. *Educational Policy*, 12(5), 525–541.
- Calabrese Barton, A., & Darkside (2000). Autobiography in science education: Greater objectivity through local knowledge. *Research in Science Education*, 30(1), 23–42.
- Calabrese Barton, A., & Osborne, M.D. (Eds.) (2001). *Teaching science in diverse settings: Marginalized discourses and classroom practice*. New York: Peter Lang.
- Calabrese Barton, A., & Yang, K. (2000). Learning from Miguel: The culture of power and science in the inner city. *Journal of Research in Science Teaching* (accepted).
- Carspecken, P. (1996). *Critical ethnography in educational research: A theoretical and practical guide*. New York: Routledge.
- Darling-Hammond, L. (1999). America's future: Educating teachers. *Education Digest*, 64(9), 18–35.
- Eisenhart, M., Finkel, E., & Marion, S. (1996). Creating the conditions for scientific literacy: A re-examination. *American Education Research Journal*, 33(2), 261–295.
- Ellsworth, E. (1997). *Teaching positions: difference, pedagogy, and the power of address*. New York: Teachers College Press.
- Fusco, D. (2001). Creating relevant science through urban planning and gardening. *Journal of Research in Science Teaching*, 38(8), 860–888.

- Fusco, D., & Calabrese Barton, A. (2001). Re-presenting student achievement in science. *Journal of Research in Science Teaching*, 38(3), 337–354.
- Glaser, B., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. New York: Aldine De Gruyter Press.
- Harding, S. (1991). *Whose science? Whose knowledge? Thinking from women's lives*. Ithaca: Cornell University Press.
- HFH. (1998). *Day to day . . . Parent to child: The future of violence among homeless children in America*. New York: Institute for Children and Poverty.
- Ingersoll, R. (1999). The Problem of Underqualified Teachers in American Secondary Schools. *Educational Researcher*, 28(2), 26–38.
- Institute for Children and Poverty, US Conference of Mayors. (1996). *A status report on hunger and homelessness in America's cities*. Washington DC: US Conference of Mayors.
- Lather, P. (1991). *Getting Smart: Feminist research and pedagogy with/in the postmodern*. New York: Routledge.
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.
- Lee, O., & Fradd, S. (1998). Science for all, including students from non-English language backgrounds. *Educational Researcher*, 27, 12–21.
- McGinn, M., K., & Roth, W.-M. (1999). Preparing students for competent scientific practice: Implications of recent research in science and technology studies. *Educational Researcher*, 28, 14–24.
- McLaren, P. (1989) *Life in schools: An introduction to critical pedagogy in the foundations of education*. New York: Longman.
- McLaren, P. (1992). Collisions with otherness: traveling theory, post-colonial criticism, and the politics of ethnographic practice – the mission of the wounded ethnographer. *Qualitative Studies in Education*, 5(1), 77–92.
- McLaren, P. (1994). Critical pedagogy, political agency, and the pragmatics of justice: The case of Lyotard. *Educational Theory*, 44(3), 319.
- National Center for Health Statistics. (1995). *Current estimates from the National Health Interview Survey, 1994*. Washington, DC: US Dept. of Health and Human Services.
- National Research Council. (1987). *Improving indicators of the quality of science and mathematics education in grades K–12*. Washington, DC: National Academy Press.
- National Research Council. (1996) *National science education standards*. Washington, DC: National Academy Press.
- National Science Teachers Association. (1998). *Pathways to national standards*. Washington, DC: Author.
- National Science Teachers Association. (1992). *NSTA standards for science teacher certification*. Washington, DC: NSTA.
- Nunez, R. da C. (1996). *The new poverty*. New York: Insight Books/Plenum Publishing.
- Oakes, J. (1990). *Multiplying inequalities: The effects of race, social class, and tracking on opportunities to learn mathematics and science*. Santa Monica, CA: RAND.
- Oakes, J. (2000). *Coursetaking and achievement: Inequalities that endure and change*. A keynote presentation at the National Institute for Science Education Annual Meeting, Detroit, MI.
- Osborne, M.D. (1998). Responsive science pedagogy in a democracy: Dangerous teaching. *Theory Into Practice*, 37(4) 225–237.
- Page, R. (1989). The lower-track curriculum at a 'heavenly' high school: 'Cycles of prejudice'. *Journal of Curriculum Studies*, 21(3), 197–208.
- Page, R. (1990). Games of chance: The lower-track curriculum in a college-preparatory high school. *Curriculum Inquiry*, 20(3), 249–264.
- Stanley, W., & Brickhouse, N. (1995). Multiculturalism, universalism and science education. *Science Education*, 78(4), 387–398.
- Strauss, A.L. (1987). *Qualitative analysis for social scientists*. New York: Cambridge University Press.
- Trueba, H. (1999). Critical ethnography and a Vygostkian pedagogy of hope: the empowerment of Mexican immigrant children. *Qualitative Studies in Education*, 12(6), 591–614.
- Villenas, S. (1996). The colonizer/colonized Chicana ethnographer: Identity, marginalization, and co-optation in the field. *Harvard Education Review*, 66, 711–731.