

THE FLORIDA STATE UNIVERSITY

COLLEGE OF EDUCATION

STRUGGLES OF AGENCY AND STRUCTURE AS CULTURAL WORLDS

COLLIDE AS URBAN AFRICAN AMERICAN YOUTH LEARN PHYSICS

BY

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Dedicated to:

My husband, Ahmed for being a super-father and husband;
My mother and father for the countless sacrifices they made to support me;
My son, Hadi, for all the days he called for me, and I wasn't there to answer;
And to Dr. Ken Tobin, who provided this research opportunity and remained a solid
support from the start to the finish.

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ABSTRACT

This critical ethnography focused on five urban African American students, coming from economically disadvantaged homes in Philadelphia, who were considered at risk with regard to their position within society as well as within the small learning community of their low-academically performing school. As participants in the study, they were employed from June 11, 2001 from 9:00 AM until 1:00 PM and continuing until September 7, 2001 at \$7.50 per hour under research grants from the Spencer Foundation and the National Science Foundation. Through this study, these five youth were provided with traditional and nontraditional opportunities to build understandings of some of the most essential concepts of physics as learners. Moreover, they also had the chance to work as research assistants, teacher educators and curriculum developers. This research was unique in that it took place within the setting of the University of Pennsylvania rather than their urban high school. The objective was to create a work environment that included a wide range of tasks that were both “school” and “non-school”-related. The artifacts produced by the students included the DUS Sound Movie, ethnographic projects in the form of PowerPoint, video footage and oral re-presentations – in addition to journal entries, documents of analyzed data, transcriptions and audio-taped/video-taped interviews.

The findings of the research conclusively reveal that African American, urban

youth from some of the most challenging situations *are* capable of learning physics concepts. Moreover, the most success resulted when students' strategies of action were directed towards the objective of learning although, in the process of meaning-making, their personal goals unrelated to science were also met. In addition, the research results also show that urban African American students come to school with strategies of action replete with cultural practices, symbols and their underlying meanings from fields outside of school including both the home and the neighborhood. In accordance with Sewell's notion of culture having weak boundaries, the experiences of African Americans as an oppressed minority has allowed the street culture to become the greatest cultural force upon African American youth. In other words, regardless of whether strategies of action have street or decent influences, the outcomes or goals being sought by urban youth are deeply aligned with the street contest for respect. These cultural resources, when triggered, then become apparent within learning environments and can powerfully assist learning when the desired outcomes of the student(s) are in tune with the objective of learning physics.

Through the physics teaching and learning that occurred within this study, as well as their work as researchers, teacher educators and curriculum developers, the youth had opportunities to utilize their cultural capital to build new knowledge schemas and to develop access to new resources. Consequently, evidence of agency on multiple levels was found to arise in conjunction with the youth's production of their DŪS sound movie. For example, for all of the youth, their participation in the research was beneficial on a personal level, in terms of the scientific understandings built and the technological skills

gained. On the community level, already, the movie has made an impact at their high school. May, Ivory, Shakeem, Randy and Tim have demonstrated that poverty stricken African American urban youth can be changed by science and science too can be changed by them.

CHAPTER I

THE PROBLEM

Introduction

*I'm going to 10th
Been headed towards college*

*I see my young boys walking the streets like they got it
On the corners 20 deep selling drugs like the cops forget it.
And get a hold of these 9s and 22s
Then talk like they got the runs
Still don't know what's a thug is about...*

*You got crimes, suicides and murders each day
Any night I get down and pray
It's really nothing more I can say
I'm spittin' from the DaBridge, life is hard to survive*

(Ivory Martin¹, 9/7/01, life rap presentation)

As this nation urgently pushes for the enactment of a standards-driven educational system, there has been a widespread tendency for teachers, administrators, policy makers and science educators to underestimate the importance of understanding the profound, sociocultural experiences that shape the lifeworlds of African American inner city high school students such as Ivory Martin. As indicated by Rodriguez (1997), the “discourse of invisibility” within the National Science Education Standards (NSES) ignores the

¹ May Jones, Ivory Martin, ShakeemYoung, Randal Waters, and Timothy McDunkin, are the students who formed the Discovering Urban Science group and are central to this study.

social, political, economic, and cultural layers each child brings to the classroom. Moreover, this is especially true of urban children, most of whom are minorities, and specifically, African-American (Seiler, Tobin, & Sokolic, 2001, Seiler, 2001a; Rodriguez, 2001).

Year after year, reform initiatives designed to improve the educational experience of American children place the educational fulcrum in the location of least leverage for African American students. The most recent example is the found within the October 2001 report, *Raising our Sights: No High School Student Left Behind* by the National Commission on the High School Senior Year. This report proposes the Triple-A Program that intends to better **align** high school proficiency standards with those expected by postsecondary institutions, to raise the bar of educational **achievement**, and to provide more (and more rigorous) **alternatives** in the senior year curriculum. This dissertation study provides evidence that such raising-the-bar solutions elude the real issues regarding African American children in America's schools and may in fact contribute to and compound the educational disparities that exist.

Minority Children in Urban Schools

Hard-Felt Poverty

It just so happens that I officially arrived to work with the DŪS² squad on the day of their first paycheck. It is extremely difficult to recount the feelings of high emotion that charged the room as Ms. Rana³ handed out their wages. It was a powerful sight for

² Discovering Urban Science

³ Rana (pseudonym) was the student teacher of the five youth in this study during their 2000-2001 school year. She was the main individual working with the teens until I physically arrived in Philadelphia to take over full responsibility of the project. She remained a confidant and support for the research until the beginning of August.

me to witness their reactions. Most notable were Tim's and Shakeem's reactions. With his booming voice, Shakeem exclaimed over and over, "Oh, shit! Oh shit!" — while laughing hysterically and practically jumping with joy. Tim's response was quieter, but equally riveting. Smiling from ear to ear, he beamed with happiness and went around the room enfolding anyone within reach with a hug. I had read of the extreme levels of poverty infiltrating America's inner cities but suddenly, the true significance of monetary capital to the urban poor became crystal clear to me.

Never before in our nation's history have more minority children been living within urban areas and attending urban public schools (Barton & Tobin, 2001). While the 2000 report from the US Census Bureau cites that an overwhelming 75% of America's people reside in urban settings, minorities and foreign-born individuals actually constitute the majority of that figure. For example, minorities represent 57% of New York City's urban population and 79% of the urban mass in Detroit (US Census Bureau, 1998). Besides being known for their immense minority population, urban cities throughout the United States are characterized by conditions of severe poverty on both individual and neighborhood levels. As the main constituents of the urban world, minorities experience poverty much more than Whites. The poverty rate for African Americans is 26% and 25% for Hispanics, in comparison to 8% for Whites (US Census Bureau, 1998). The stratified nature of life in America--the tension between the suburban rich and urban poor --between Whites and Minorities--is felt intensely within the great city schools. The presence of an essentially white superclass and a basically minority underclass (Barton, 2001) contributes to a perplexing imbalance in society which, in turn, exerts great forces upon the lifeworlds of minorities living in urban centers and attending inner city schools. This research focuses on understanding some of the remarkable forces that shape the teaching and learning of physics for African American students who attend neighborhood

schools in large inner city communities.

African American Children in Urban Schools

Since their arrival to America as slaves, African Americans have been struggling to overcome their underclass status in this nation (Norman, Ault, Bentz, & Meskimen, 2001). In accordance with Fisher et al. (as cited in Norman et al., 2001), apparent connections have been found between the societal perception of a particular group of individuals by the dominant culture and the economic and social positioning of subcultures. Those societal perceptions filter down into the urban school microcosm/classroom, thus, directly affecting the learning environment, teacher/learner relations and the teaching and learning of science. In fact, as involuntary minorities (Ogbu, 1998), African Americans represent one of the minority groups that experience dramatic educational consequences from urban dilemmas. This is evidenced by broad achievement rifts between White and African American students on high-stakes tests (Norman et al., 2001).

Looking at the Test Scores

The most profound example of the vast difference in White and African American students' education becomes evident through Berliner's (2000) analysis of the TIMSSR data through racially-tinted lenses. When America's results are separated according to students' race, White students were found to score only three countries below the highest scores worldwide, while African Americans were ranked at the very bottom. These dramatic gaps in performance are not abnormal occurrences, rather they are evident across the states in high-stakes exam results, including SAT (Scholastic Achievement Test) and NAEP (National Assessment on Educational Progress) (Rodriguez, 1997).

Such gaps in achievement indicate that urban African American students' experiences in our education process vastly differ from those of White students. The following informal exchange captured between Ivory, Randy and Akram⁴ provides an illustration of the grim statistics found in the literature.

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.

Akram: Why not?

Ivory: Cause I'm not.... The teachers gonna say the same thing.

Characteristics of Urban Schools

Urban schools are characterized by a lack of qualified teachers (Darling-Hammond, 1994), a presence of low-level, non-connected curricula (Haberman, 1991), an absence of adequate resources (Roth & Tobin, in press; Tobin, Roth & Zimmerman, 2001), a deteriorating budget (Ingersoll, 1996) and oppressive schooling practices such as academic/vocational tracking.

Teacher Quality

Despite the fact that teacher qualifications have been steadily improving in recent years, with as many as one in four teachers holding a masters degree or higher when hired during 1990-1991 school year (Gray et. al, 1993), there remain epidemic levels of under-qualified science teachers and out-of-field teachers in urban schools (Ingersoll,

⁴ Akram (pseudonym) is a graduate student who was hired to support this research project throughout the summer. His primary roles included supervising the students while they were not working with me, video taping learning sessions, and guiding the students' development of teacher resources, i.e. their movie on understanding physical science concepts related to sound.

2000). Most shocking is the 2000 release of *The Urban Teacher Challenge: Teacher Demand in the Great City Schools* stating that 80% of urban middle schools and 95% of urban high schools indicate an urgent need for science and math teachers (The Urban Teacher Collaborative, 2000). Unfortunately, “inner-city high school students in high-minority schools have only a 50% chance of being taught by a qualified mathematics or science teacher” (Darling-Hammond, 1994, p. 11). Instead, urban children are taught by substitutes, beginning teachers lacking adequate preparation, or inexperienced teachers who do not last even the complete school year (California Commission on the Teaching Profession, 1985).

Resources

In addition to a lack of human resources such as qualified teachers, African American students attending urban schools experience extreme shortages with regard to the availability of material resources necessary for learning science. This problem is best understood by listening to accounts from individuals surrounded by the crisis. The following excerpt describes a co-teacher’s experience in a high school chemistry class in an urban school:

I wanted the students to prepare their dilute solutions and systematically mix small volumes with one another to see if reactions occurred. Disaster! Insufficient spatulas! No benches to spread out the chemicals. Not enough equipment to mix all of those solutions and place them so that others would have access to them... The solutions should not be going down the sink! The students were making a mess and there were no paper towels to clean up. (Roth & Tobin, in press)

A student teacher’s narration of her first day in an inner city school sheds more light to the chronic situation.

I remember returning from my first day of student teaching and thinking, how am I going to teach science in such barren and gloomy conditions. Our 35 students were crammed into one classroom with no laboratory or even sink access... The lack of laboratory access was astounding to both Sonny and me, especially since several lab rooms were reserved for “holding” students whose teachers were absent... (Tobin, Roth & Zimmermann, 2001)

Curriculum Quality

In addition to serious questions regarding the quality and availability of urban teachers and material resources, the curriculum being enacted in urban classrooms is quite disconcerting. According to the findings of Haberman (1991), urban teachers in inner city schools engage almost exclusively in a pedagogy of poverty with their curriculum “characterized by teacher-controlled activities such as: giving information, tests, directions and grades; monitoring seatwork; settling disputes; and reviewing tests and homework” (Songer, Lee & Kam, 2001). Hence, pedagogy of such low expectations translates into curriculum which does little to foster engaged scientific thinking, does not typically relate to students’ lives or support students’ interests. In addition, driven by high accountability policies, urban teachers, particularly elementary teachers, focus most of their teaching on reading and math since these subjects will be tested on state and national levels (Knapp & Plecki, 2001). Furthermore, Becker (cited in Songer, Lee & Kam, 2001) documents that low-income urban school curriculum is rarely enriched through inquiry-based, problem solving, technology-supported activities. If urban students have regular access to computers, they are used for drill and practice activities.

The Role of Urban Schools in Social Reproduction Patterns

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)

Evident from our long historical struggle to restore inalienable educational rights to African American children, America's education system has always been deeply affected by the political weather of the country. Decades after the desegregation of American schools and appreciable civil rights gains, the apparent condition of science teaching and learning within inner-city schools exists as a bitter reminder of this country's grim racial past, modern day social inequities and the continual struggle of African Americans to vacate their disadvantaged position in society. Moreover, the disturbing history of schooling in America has served to erode trust in education as a transformational process rather than a reproductive one. While many African American students possess real hopes that their lives can improve through schooling, in reality, there exists a vicious cycle in which the current urban minority socioeconomic standard of living *is reinforced by* and simultaneously *reinforces* the urban, African American experience in the educational system. Hence, in its current state, urban schools, in particular, can be perceived as active agents in the reproduction of socially stratified levels existing within the greater society. Barton (2001) elaborates:

Science education has become more about presenting students the science they need to fit into society rather than about educating students about how they might produce, use, and critique science to work with and transform society--going to school does not enhance one's chances, because even if everybody was learning

something, schooling is still leading to stratification and the shaking out of those lower in the strata.

However, in the same manner in which education reinforces societal oppressive structures, education also holds the potential to act as a transformational force that can improve the lives of urban youth (Freire, 1970). More specifically, in this study, science education is viewed as a site in which students can increase their agency (Sewell, 1992) so as to transform the social structures that hold them at bay and sustain their oppression by a dominant White, patriarchal culture.

Interrupting the Cycle: Social Transformation

Although there are many areas in which urban science curriculum should be improved, some researchers suggest that paramount attention should be directed toward connecting students' lives to science learning. For example, Norman et al. (2001) have suggested that the key to improving the falling trajectory is to validate, value and connect science to urban students' "knowledge and experiences of poverty, injustice, work, racism, environmental despoliation, and social history. ..." In support of such suggestions, this dissertation study specifically explores the potential for the enactment of a physical science curriculum that validates, values and connects to students' *cultural resources* – such as, language and interaction patterns, skills, common values, ethics, morals, aspirations, rituals, beliefs, goals, and social behaviors [including practices, many of which are taken for granted or *habitus*]. As expressed so clearly by Freire (1993), "We want a truly competent public-school system: one that respects the ways of being of its students, their class, their values, their knowledge, and their language" (p. 37). This particular goal requires the school system, from teachers and administrators to policy

makers and curriculum writers, to be able to identify cultural tools held by African American children, both consciously and subconsciously. With the present disregard for the “culture and consciousness” (Seiler, 2001a) of urban, African-American children in the enactment of science curriculum, the current education system seems to be failing to teach science to African American, poverty-stricken urban youth in a significantly meaningful manner. In the case of the majority of these urban youth, twelve years of science education does not result in a transformational force for improving their lifeworld conditions.

This research helps to provide clear images of the ways of being and knowing that urban African American students like May, Ivory, Shakeem, Randy and Tim hold within their cultural toolkits, and how these resources are engaged in a variety of contexts – ranging from home to neighborhood, and, of ultimate interest, to a science learning environment. In addition, the study simultaneously recognizes that a number of these resources can be utilized in manners that the education system does not perceive as beneficial, but rather as detrimental to the learning process.

The need for research in urban schools. Despite compelling evidence, rather than focus research efforts and reform initiatives upon an urban context, science education researchers have tended to focus on the middle and upper class levels with the assumption that results would be applicable to the teachers and students within urban schools. The literature on how to address teaching and learning in urban city schools is inadequate, and, despite sincere efforts, policy makers have been unsuccessful in

developing reform initiatives which are able to improve the gap of achievement existing between White students and economically disadvantaged, African American students.

In the NSES (National Research Council, 1996) call for action, it is earnestly stated that “all students deserve and must have the opportunity to become scientifically literate” (p. ix). If the United States is truly committed to the establishment of social justice within our urban city schools, researchers must be committed to a science education in which the teaching and learning of African American urban youth understands the impact of social, political and economical struggles they experience daily (Barton, 2001). In their article regarding the renewal of urban science teaching, Knapp and Plecki (2001) question if we really understand how such forces and conditions shape urban teachers’ classroom practices and their students’ learning. In order to answer such a question and in order to advocate improved urban science teaching, it is important for research studies to understand the sociocultural background that strides through the classroom door with every student. As expressed by Tobin, Roth & Zimmerman (2001), “To teach successfully in an urban school, in ways that are potentially transformative, teachers have to learn to identify and connect with the social and cultural resources of their students.” To be specific, there is a need to understand the individual lifeworlds of the students on a micro-level so that teachers may begin to intimately understand, on the macro level, how cultural capital from the home and neighborhood crosses the boundaries of school walls and classroom doors and can help or hinder the science learning process.

This research shows that such culturally-grounded understandings should be taken into consideration in any effort to develop science teaching and learning practices that are equitable and emancipatory rather than oppressive; and empowering and inclusive rather than reproductive of the social and economic levels indicative of our capitalistic/democratic society. We must remember the goal is “a future in which all Americans, familiar with basic scientific ideas and processes, can have fuller and more productive lives” (National Research Council, 1996, p. ix).

Purpose

This study focuses on the teaching and learning of physics of five urban high school students from an African American ethnicity and backgrounds of economic distress. Conducted with a methodological framework of critical ethnography, this study provides clear images of what it takes for an urban teacher/researcher to receive the respect of urban minority youth, build rapport and establish meaningful relationships while enacting a curriculum that sought to actively engage their social and cultural capital. While interacting with five students, two female and three male, from City High School⁵, from June 11, 2001 until September 7, 2001, of which, a period of six weeks was devoted to the informal teaching of physics concepts, two overarching questions guided my research:

1. What is occurring with regard to the students’ learning of physics?
2. Why is this happening?

To focus more closely on issues of social and cultural capital, respect, rapport, and

⁵ Pseudonym

relationship, the following questions were addressed:

1. What components of the students' social and cultural capital are favorable to their learning of physics?
2. What components of the students' social and cultural capital may work adversely to their learning of physics?
3. If students are oppositional to the physics curriculum being taught, how might I as teacher/researcher adapt my teaching to create a learning environment with attractive opportunities for the students to actively participate and effectively learn science?
4. How do issues of respect become part of the interactions between the students and between the students and me?
5. How do rapport and relationships develop over the summer?

Through answering these general and specific questions, this study leads toward understandings about the structured lifeworlds of urban African American youth, their cultural assets for learning physics, and their potential for exercising transformational agency.

Context of the Study

University of Pennsylvania

The research project was situated within the University of Pennsylvania. While the DŪS group had access to a main room for learning activities, we also utilized two researchers' offices. One office held the status of the "video editing room" since it contained a complete video editing setup. Additional technology resources included four

computers with internet access as well as Microsoft Office functions and one computer that could be utilized for word processing and the creation of PowerPoint presentations.

The reason for locating the project at the University of Pennsylvania was to provide the youth and myself with freedom from some of the constraints associated with urban schools. On a university site, we could have access to facilities such as well-equipped libraries and science labs. In addition, being away from their school building seemed conducive to diminishing the management issues commonly associated with urban classes, for instance, students sleeping, being inattentive, or creating disturbances (e.g., Tobin, Roth, Zimmermann, 2001).

Participants

Students from City High School

May, Ivory, Shakeem, Randy and Tim attend City High School during the school year. While Tim was a to-be senior, the remaining four students would be sophomores in September. City High can be described as a representative model of a poor urban school (Seiler, Tobin, & Sokolic, 2001). With its student population of 2300, this large inner-city, neighborhood school in Philadelphia is 87% low income. In a school district with 64% African American and 19% White, it is interesting that, according to 1998 statistics, City High student body is 98 percent African American and 0 percent White (Philadelphia Online, 2001). Moreover, at the bottom rung of a three-step system of public schools, City High School fits the description of a city school with low

achievement (Kozol, 1991), rather than a city school with high achievement or a suburban school. The academic status of City High becomes more pronounced upon studying its 2000 report card. Only five public schools in Philadelphia scored lower than City High on the SAT math test. Moreover, there was almost a 275-point difference from City High to the highest scoring school in the school district of Philadelphia (354 as compared to 628). The trend for the verbal SAT scores is just as dismal with a point difference of about 250 between City High and the top scoring school (366 versus 620) (Philadelphia Online, 2001). The Pennsylvania System of School Assessment (PSSA) test results further indicate a low achievement pattern for City High. In 1998, eleventh graders scored an average of 1010 in reading and 1000 in math with only about 55% of the students taking the exam. In comparison, the highest SAT scoring school averaged scores of 1520 and 1600 in reading and math, respectively, with 100% of the student body taking the exam (Philadelphia Online, 2001). The academic condition of schools like City High has reached so critical a level that unless student performance follows a continuously upward trajectory; the state has asserted usurpation of the city schools (Seiler, Tobin, & Sokolic, 2001).

Although CHS is divided into small learning communities (SLC) or a school-within-a-school model to foster a spirit of community and cooperation, students are generally described as engaging in seemingly resistive, uncooperative behavior and attendance is generally low, with the daily turnout at 60 percent (Seiler, 2001a). There are 10 SLCs, which focus on varying themes, enroll 200-250 students and employ an average of seven teachers per community. Only two of the SLCs aim for college

preparation, while the others are more career-oriented. For instance, the five students who were involved in this study are from the SE²T (Science, Enterprise, Education and Technology) career-oriented community.

Employment of the Students in the Study

Since City High students customarily seek employment during the summer months, the five student-researchers, May, Ivory, Shakeem, Randy and Tim, involved in this study were employed from June 11, 2001 from 9:00 AM until 1:00 PM and until September 7, 2001 at \$7.50 per hour under research grants from the Spencer Foundation and the National Science Foundation (excluding the week of August 20th -24th). The fact that the DŪS youth were compensated, while simultaneously expected to take part in science-related activities, is an interesting characteristic of this study. While the five teens worked within a voluntary research context in which they would be rewarded (financially) for participating in the building of science understandings versus being in a mandatory school context in which their learning would be tied to exams, report cards and grade promotion, on numerous occasions, Ivory, Shakeem, Randy and Tim expressed similarities between their employment and school. One such conversation occurred on June 21st before my arrival.

Randy: I understand it's a job, but we still learnin'.

Akram: So you likes school ended, summer started.

Randy: Yeah.

Keem: Well, we get paid for summer school that's all it is.

Ivory: This is like

Randy: That's all it is.

Akram: Right

Randy: Runnin' around outside lookin' at sound and stuff. All that ...

Ivory: Just more. ...

Akram: So what is it? I mean do you like school during the school year, or you just don't. Is it that school, no matter when it is, it's not cool for you?
Randy: School year and this is the summer.
Keem: I hate the school year too.
Akram: So it wouldn't matter if we were doing this in September, you still wouldn't be feelin' it?
Randy: September. I got to do it in September.
Akram: And now you don't have to?
Randy: Yup ...
Ivory: It's like a summer--it's like a big summer school. It's like I thought we was going to do different stuff here.
Akram: The fact that it's like school is not good for you? Like you don't like it?
Ivory: It's alright. I didn't say I didn't like it. It's just school again.
Tim: It's just that I didn't expect to be working at school.
Ivory: It's like school all over again.
Rana: Why is it like school?
Ivory: It's like school. We come in here everyday, sit down. All day we talk.

Placing the learning of science at the center of the study introduced a tension that never quite disappeared. When, in fact, we engaged in science learning activities, often the youth's habitus or normal way for interacting in a school setting became triggered (i.e. I encountered behaviors typically expected in a school setting rather than an employment situation). Clearly, the multiple roles, which the students and myself, engaged in, and the power relationships that emerged added to the richness of the data that arose.

Time Line of the Summer Project

June 11, 2001 – June 22, 2001: Science in the Movies Project

Since I could not physically join the group prior to July 5th, the time period prior to my move to Philadelphia was designated as a time when their former student teacher, Rana, and a graduate school assistant, Akram, would help me accomplish two main

goals:

- Ascertain the students' interests and hobbies, and their perceptions of the school, small learning community and science.
- Provide learning opportunities for the students to begin forming understandings of physical science concepts related to sound.

During the first week of their employment, May, Shakeem, Randy, Ivory, Tim, Rana, Akram and I consolidated a group referred to as Developing Urban Science (DŪS). I participated within the community first through interactions with Rana and then with the students, over email. When Rana and I discussed activities that would be informative to research, she suggested an introductory activity, the *Science in the Movies* project. This project involved the youth in identifying movies they had watched and/or enjoyed that contained science segments or themes. The list that unfolded contained eighty-eight titles, ranging from science fiction plots such as the *Red Planet* to cartoons like *Pokemon*. Out of the haystack, *Men of Honor* was selected for viewing particular segments and answering science related questions. The journey of science learning had begun.

During this time, I began to communicate with the students by email and focused intensely upon building relationships and establishing rapport and respect. In addition, I began eliciting the student-researchers' perceptions regarding DŪS, the *science in movies* project and science, in general. Through our communications, I learned about the youth's interests, talents and developed basic ideas regarding their personalities.

June 25th – July 13th: Sound in the City Project

Compared with *Science in Movies*, the *Sound in the City* project spanned a longer

time period, engaged the students in more intense interactions with sound-related physics concepts, and provided excellent data regarding the role of the cultural resources of the DŪS group within their learning process. This unit was product-driven in the sense that it centered on the development of a teaching resource for physical science classes -- a movie about sound. It is important to note that although the curriculum focus shifted to different physical science concepts following July 13th, the production of the 43 minute sound movie and specifically the video editing process remained a daily undertaking until reaching completion when the summer came to a close.

The *Sound in the City* unit began by asking May, Ivory, Randy, Shakeem and Tim to each walk down a busy city block, full of construction and traffic congestion, as well as in a much quieter area, not far from the busy streets known as Serene Walk⁶. Every twenty yards, on average, the DŪS members stopped to listen for 5 minutes and record the sounds they detected as written observations to be presented in oral format, at a later time. This activity was designed to encourage the students to take notice of the different sounds in their city lives, so that they would begin to think about:

1. why particular sounds are more noticeable than others (amplitude, frequency, velocity);
2. the potential harm that can arise from loud noise; and
3. pressing social issues related to sound, for example, the lack of protective measures taken to help prevent early deafness in construction workers.

Collecting sound facts. Building upon discourse that was initiated during the

⁶ Serene Walk is situated between campus buildings, thus it provided a contrast to the sounds heard upon the main campus streets.

outdoor excursion, for the next portion of this unit, the five students began internet research to find websites that provided sound-related “facts” or concepts – fifty was the aim. When I physically arrived to join the students, fifty sound facts had already been gathered and combined into a list. As an initial priority, I reviewed the sound facts. Following the elimination of duplicated concepts as well as combining facts that were related and easily connected, the list was compressed to 35 essentials. Divided between them, this fact list provided May, Ivory, Shakeem, Randy and Tim with guidelines for developing their sound movie. However, in order to effectively film these facts in a manner that other kids could understand and learn from, the DŪS squad soon realized that their own understandings would have to come first. As a result, the remainder of the unit was dedicated to the creation of learning experiences that would help May, Ivory, Shakeem, Randy and Tim build understandings of:

1. sound as mechanical vibrations;
2. sound as the movement of energy in the form of waves;
3. wavelength for transverse and longitudinal type waves;
4. physical interpretations of frequency as pitch
5. visualizations of high and low frequency wave patterns
6. mathematical relationships of frequency, wavelength and velocity in the equation
 $v = f \lambda$ (velocity equals frequency times wavelength)
7. physical interpretations of amplitude
8. visual representations of a loud and soft wave patterns
9. propagations of sound through different mediums and the consequent velocities;

10. creations of standing wave patterns through interference and resonance;
11. biological understandings of the ear and how sound is interpreted by the brain;
and
12. harmful effects of sound on the human ear.

Most learning experiences centered on popular experiments for which materials can easily be found at home. For example, the kids experimented with sound by talking through telephones made from tin cans and strings of differing thicknesses. In addition, a baby monitor set provided an avenue for the group to visualize the physical representation of amplitude differences in their voices. On another occasion, playing with two identical glasses containing varying amounts of water as well as with containers made from different materials sparked conversations involving frequency. Attaching a rope to the wall, the group set up varying standing wave patterns depending upon the frequency at which they vibrated the cord. Furthermore, an object as simple as a plastic slinky allowed students to be able to visualize characteristics of sound and elicit related scientific discourse. With one end of the slinky attached to the wall and the free end controlled by a student, we held conversations about transverse and longitudinal waves, transfer of energy, reflection, and constructive and destructive interference.

Following these and other experiences, DŪS took a trip to a physics lab on the university campus where they experimented with four typical labs found in undergraduate physics labs. I was interested in observing their interactive patterns with foreign equipment and their ability to make connections between activities we had done with familiar objects and these unfamiliar college labs that addressed similar concepts.

The labs were taken from the University of Pennsylvania Laboratory Notes for Physics (1997):

1. Open Water Pipe sound experiment,
2. Melde's Experiment on Stationary Waves or "String Lab",
3. Acoustic Interferometer or "Sliding Trombone" experiment; and
4. a setup containing a sound generator, microphone and oscilloscope.

Creating the sound movie. Ivory, Shakeem, Randy and Tim were allowed free reign in determining the manner in which they wanted to present the sound facts or concepts in their movie. Drawing upon their cultural capital, the students incorporated acting, rapping, music, dance and peer interactions to teach sound for their film. In Shakeem's view, they were "learning science for the kids". In addition to understanding and presenting these facts, the DŪS group was also asked to develop skits that connected sound to different aspects of everyday life. While Shakeem focused on sound and nature, Ivory was responsible for establishing a link between the human body and sound. May concentrated on finding sound and health connections. Randy participated in the others' skits.

Following the recording of the skits and facts, the students translated the videotaped clips from analogue to digital form by utilizing a dazzle converter, I-movie software, and a VCR. Once all of the clips were in a digital format, Akram worked with the individual to edit the clips featuring him or her. As the summer progressed and they became more and more proficient, the individuals began working in pairs rather than with Akram. Together, without receiving any feedback from me, they decided the order for

the edited video clips, and as the movie developed further, details such as titles, sound effects and transitions were added. The result, in Ivory's view, was a movie "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-mean⁷? So ya'll can better understand how to do things in ya'll classroom." Moreover, through their learning, the DŪS group would be, as expressed by May, "helping younger children to look at science in a different way."

July 16th – July 18th: Electricity and Magnetism Activities

During this period, the DŪS youth were provided with a variety of activities that addressed electricity and magnetism. On the first day of this unit, I developed five different stations with experiments that dealt with static electricity. *Snapping to the Music* station provided opportunities to learn how static charges produce sound when different types of fabric were used to rub a large plastic spoon and then come close to metal objects such as a paper clip or metal pan. Several of the stations were set up for learning about the force of attraction between charged objects, including *Lifting without Touching* which required building an electroscope and *Let's Come Together* which involved hanging balloons from the ceiling, charging one and watching the static electricity effects. *Move That* encouraged experimenting which types of materials could be charged (and how) so as to attract aluminum foil pieces. Perhaps the most dynamic station, *Light that Thing Up*, was one in which the students were able to light up a fluorescent tube by simply rubbing it with a balloon.

⁷ The expression, "You know what I mean?" is abbreviated in speech, "Ya-mean?"

The concepts of static electricity were built upon as we shifted to the development of small series circuits. The level of sophistication ranged from circuits designed with aluminum foil and/or electric wires, batteries and light bulbs to using a potato and a D-cell to make a potato circuit. Through making the circuits, the students learned about conductors and insulators of electricity and were encouraged to talk through what was occurring inside the circuit with regards to electron movement.

Magnetism activities were limited; however, two main stations were incorporated amidst the electricity ones. At one center, the group had an opportunity to use a six-volt battery-driven electric current to create a magnet out of a large iron nail. At the other station, magnets and objects that magnets attract were provided to engage the students in learning about the different magnetic poles, attraction and repulsion forces, as well as the ability for certain objects to become temporarily magnetized.

July 19th – July 27th: Newton's Laws

Two major activities characterized this unit on Newton's laws regarding forces, velocity and acceleration – the *Egg Drop* and the *Puff Mobile*. In the first experiment, DŪS was provided with various materials, including cotton, fabric, balloons, Styrofoam, cardboard and other materials to design a protective module in which an egg could be placed and dropped from a high location. An unbroken egg represented the immediate goal, yet the deeper intent was to help the group to learn about forces, velocity and acceleration by measuring the distance the egg was dropped and recording the time period for the egg to drop. The puff mobile also fore-fronted force and motion concepts by having the youth build their own cars and/or rockets that were powered by balloons

from materials such as paper, straws, and life saver wheels. Both activities were designed to encourage discussions about Newton's laws of motion. In addition, a basketball videotape, computer basketball game and student narratives of their own basketball plays were also central to eliciting science discourse during this unit. Finally, I utilized props such as a wind-up car, water and oil to ask the students to turn a tabletop into a racecourse. Through experimentation, some scientific understandings regarding the force of friction, gravity and acceleration as well as the effect of equal and opposite forces were formed.

July 30th – August 16th: Research Assistant Role

By this point in the summer, data collection of science teaching and learning was overwhelming. The number of video and audio tapes had reached alarming numbers, and the prospect of being able to analyze all of their contents appeared challenging, at best. I decided that it was time to ask the DŪS group to switch roles from primarily learners of physics to primarily research assistants who would aid me in exploring the data collected. However, despite the new tasks which May, Ivory, Shakeem, Randy and Tim would engage, the production of their movie would continue throughout their four hour day, by having each person take a shift. I set up a design in which we would rotate between working stations. We had access to four different rooms, so often the students were able to work alone in their own office space. The products that emerged are as follows:

1. Transcriptions of audiotape interviews and science learning interactions between the members of the DŪS group.
2. Transcriptions of videotaped science learning interactions.

3. Transcriptions of freestyle raps captured on videotape.
4. A list of student-researcher questions regarding videotape segments of science activities.
5. A written record of student perceptions on videotape segments of science activities.
6. List of all of the audiotapes in the study and detailed summary of tapes' contents.
7. Internet data on the census tract information for the members of DŪS, including the statistics regarding graduation rates, degree levels and average income levels and employment status.
8. Internet newspaper articles on topics that relate to the teens' lives and their perceptions on the events.
9. Student-conducted interviews to obtain descriptive, ethnographic information of the DŪS group individuals.

August 27th – September 7th: Three-Tiered Ethnography Project

As the summer neared the end, the students needed an opportunity to be involved in a different type of research activity. With their sound movie nearly perfected, and having tired from transcribing audio and videotape interactions, conducting and participating in interviews, listening to audiotapes from the summer and watching videotape excerpts, these five teens were asked to develop their own ethnographies. Although I originally wanted to find out about three cultural nodes in their lives—home, neighborhood and school—each individual preferred to decide which stage to foreground for the project.

Randy and Shakeem selected to develop videotaped ethnographies of their neighborhood streets. In addition, they developed specifically relevant questions so that through an interview format, they could provide more information regarding the events, people, and locations they chose to record. They then selected segments of their neighborhood footage and interviews to edit and create a movie of life in their neighborhood. Following completion of the video ethnography, Shakeem utilized the remaining few days to develop an emotionally-charged PowerPoint presentation depicting how he felt about his life. Both May and Tim also chose PowerPoint as the medium for communicating ethnographic data, although May originally began her project by trying to write a poem about her life at home, in the neighborhood and at school. Tim developed an extensive PowerPoint presentation; it began with slides revealing his role models, then moved to provide detailed information about his educational history and finally, ended with his future goals. In May's project, she developed a collage of slides that featured information about her family and the rules she lives by, her future goals as well as people whom she respects. In contrast to the other members of DŪS, Ivory chose to write a rap about her life, memorize it, transcribe it onto the computer and provide a written explanation to accompany the lyrics. Through her production, she communicated significant aspects of her home, neighborhood and school.

Over the past few pages, I have attempted to provide a vivid timeline of the activities that occurred throughout the summer as well as descriptive details regarding the various roles that the students played. In the next section, this timeline is situated within the "bigger picture" as I present the overview for the entire dissertation.

Overview for the Dissertation

Chapter one. In chapter one, a comprehensive literature review depicts the status of science education in urban schools -- with particular reference to urban African American students. In addition, the chapter emphasizes the need for research on how science can become a transformational force in urban African American students' lives, thus providing a rationale for this research endeavor. Finally the purpose of the study is delineated, contextual elements are introduced, and the events of the summer are summarized to provide a macro view of what occurred.

Chapter two. Chapter two presents the theoretical underpinnings for the study. Utilizing Sewell's theories, culture is theoretically conceived as both a *system of symbols and meanings* and *systems of practice* (Sewell, 1999). In addition, drawing upon theories of Giddens and Bourdieu, this study views urban school culture as structured by dominant middleclass/upper-middleclass cultural schemas and reinforcing sets of human and material resources (Sewell, 1992). By understanding that such structures shape the social actions and interactions of African American youth in inner cities, the chapter includes theoretical explanations regarding one major component of structures--the concept of agency or one's ability to exert direction over social actions and interactions. Finally, an important theoretical link between Bourdieu's theories regarding cultural and social capital and habitus (i.e. 1977, 1990, and 1992) and issues of agency is established.

Chapter three. Chapter three describes the methodological frameworks for this study. Since the research centers on issues of empowerment, transformation, and social justice, I conducted this study as a critical ethnography for it is an approach most aligned

with such goals – (Barton, 2001; Pizarro, 1998). In a critical ethnography, the educational process, schools and, thus, the teaching and learning of science may be viewed through political lenses. Both macro and micro perspectives are undertaken in analyzing the data resources, and the criteria utilized to ensure the quality of this investigation is also disclosed.

Chapter four. This chapter forefronts science teaching/learning vignettes for the purpose of identifying specific strategies of action engaged by May, Ivory, Shakeem, Randy, and Tim within the DŪS science learning environment. In doing so, the chapter brings to surface the necessity of understanding the *origins* of the cultural resources that appeared in this school-like setting as a prerequisite to understanding the role that they played in the students’ science learning process. Most importantly, this chapter sets the stage for a comprehensive look into the neighborhoods and homes of these youth.

Chapters five. Utilizing Sewell’s theoretical lens (1999) that conceives culture as weakly bounded and characterized by patterns of coherence and contradiction, this chapter reveals that the students’ strategies of action appearing within the learning environment, as well as the associated goals, originate within their homes and neighborhoods. Consequently, greater understandings of the five youth within the DŪS learning environment is achieved by expanding upon Anderson’s (1999) sociological theories for making sense of urban home and neighborhood cultural symbols and practices.

Chapter six. In this chapter, some of the images of science learning presented are counter-traditional and suggest that the DŪS Sound Movie challenges status quo

science programs like *Bill Nye the Science Guy*. Moreover, the sound movie production process is discussed in terms of student agency and social transformation, and the prospects of hope for May, Ivory, Shakeem, Randy and Tim's future are examined.

Chapter seven. The research questions raised in chapter one are addressed with specific attention given to describing how this study was either potentially transformative for these students or simply another reproductive cycle in which they participated. Finally, from urban students to policy makers, the widespread implications for the study are addressed.

Conclusion

Through this dissertation study, I sought to engage the students in learning physics and comprehend how their cultural capital affected their learning. It was an opportunity for me to look at learning, but more specifically, at scientific thinking in a small learning community of African American urban males and females. In addition to providing May, Ivory, Shakeem, Randy and Tim with opportunities to build understandings of some of the most essential concepts of physics, they also had the chance to experience the position of being research assistants and teacher educators. Through an analysis of the data resources collected from all three of these roles, I have formed rich images of what African American, urban youth from some of the most challenging situations are capable of accomplishing in science and how their accomplishments could help transform their lives. This dissertation tells a graphic,

sometimes uplifting—sometimes depressing, story about five truly phenomenal urban kids and their journey of learning physics.

CHAPTER II

THEORETICAL FRAMEWORK

The Reproduction of Social Stratification

Students Who Fall Through the Cracks

Today was so hard. I struggled most of the time that we were in the physics lab to engage Shakeem and Ivory in meaningful learning activities. Shakeem is a great person, very smart—sharp is the word I like to use. When he chooses to apply himself, he picks up the conversations, adds his ideas, and builds understandings so that he is an active science learner. But I don't know how to tap into his potential on a regular basis. It seems that he decides, basically, when he engages. What makes this happen? I wish I knew. Is the physics lab too removed from the kids' realities? What connection does it have to their lives? Come to think of it, what is important to them?

At lunch Shakeem strongly criticized the lab day. "It SUCKED!!" He told me at least ten times, making sure to hold the flat microphone of the tape recorder right up to his lips as he spoke. My stomach turned a bit and I began to wish I hadn't asked for the kids' perspectives so soon after eating lunch! The high frequencies hurt his ears. Basically, it was too loud for him, and I do agree that at certain points, the noise level

was “crazy high” (as Akram put it). Then it was Ivory’s turn to speak. She felt that I was saying the same things over and over. She didn’t think she learned anything new or different from the activities we had been doing outside the physics lab. I really have to disagree. Maybe she didn’t learn anything new from me saying it, but I feel that she definitely grasped deeper understandings of standing waves, interference and resonance due to her engagement, though limited, in today’s labs. I think she did the most learning when she “taught” the rest of the class. What had happened was that just as our time in the lab neared to the end, Ivory went to the board to explain the water pipe lab to Shakeem. She got into standing wave patterns and how they form through reflected wave interference. But what triggered Ivory to go to the board?

The major contradictions rested with Randy and May. Both of them were on task and engaged probably 90% of the time. Randy was the one driving everyone crazy with the frequencies and amplitudes. They worked individually, but both were doing a great deal of experimentation. Randy spent most of his time with the microphone and oscilloscope setup while May spread herself between the string lab and water pipe experiment. When Randy stopped working, I found him sitting and singing, quite loudly, “HMM, HMM, HMM. It’s all about the frequency and the high and low push of this and the little carry-o of this. HMM, HMM, HMM. HMM, HMM, HMM.” May called me over at one point to share something new that she had learned on her own. She was so proud of herself. (Rowhea Elmesky, personal communication, 7/17/01)

I'll always remember July 17th, 2001. I called it Physics Lab Day. It was the first and last time I took the DŪS group to the physics lab on Penn campus. Although it was not easy, I forced myself to write about this experience immediately following its occurrence. The above excerpt from my journal captures the mixture of frustration, disappointment, confusion and hope that simultaneously filled my being that morning. When I contemplate upon challenging days like the Physics Lab Day, it is a reminder that everyday, throughout urban schools all over the United States, teachers, like me, sometimes feel helpless and unsure of how to reach students like May, Ivory, Shakeem, Randy and Tim. With home and street cultures that differ from the dominant, White, upper class, patriarchal school culture, more times than not, urban African American students from poverty backgrounds fall through the academic cracks like grains of sand fall through a sieve. The majority is unsuccessful in school and usually remains unsuccessful afterwards--never moving much higher than the working social class level it currently inhabits.

Understanding African American, Inner City Students' Cultural Background

In a nation that houses approximately five million millionaires and nine million Americans with an annual household income of \$100,000 (*The Economist*, 2000), one would like to believe that the education system contributes to the social mobility of the majority of the population. However, the reality is that the condition of the majority remains at the working class level. Therefore, while conformity to school culture and high aspirations may be the key to the rich getting richer, for poverty stricken African Americans, the result is that the poor keep getting poorer. In fact, the experiences of “the

Brothers” in Jay MacLeod’s (1995) study clearly reveal the limitations that African American’s compliance with the school culture and possession of high goals have upon the attainment of academic or real world success. In contrast, this study suggests that the key to alleviating teaching practices that contribute to the reproduction of the social class stratification is for the current school culture to recognize, understand and integrate African American students’ cultural resources in ways that enhance the classroom learning environment.

The existing body of literature available to help educators understand students like the group is extremely lacking. In a recent NSF proposal, Tobin (2001) wrote,

As a teacher-researcher I struggled with contradictions and resistance and found little in the way of research to support my efforts to teach high school science in the low-track of an inner city high school (Tobin, 2000). What I needed is ... clear examples of what experienced urban teachers could do to build relationships with urban students, earn their respect, get them actively involved in the curriculum and to thereby enhance their learning.

Thus, while understanding the cultural and social forces affecting African American youth from poverty backgrounds is a necessary prerequisite for teaching them effectively, too few teachers truly understand the cultures from which these urban students come (Barton, 2001). Moreover, with schools rewarding the students who possess knowledge that is grounded in their lives in middle and upper class families, African Americans from inner-city, high poverty backgrounds are being marginalized in school (Brickhouse & Potter, 2001). Coming from cultural backgrounds that engage symbols and meanings that result in systems of practice very different from those required in school, inner-city African American students are unable to utilize their cultural capital to learn in meaningful ways (Tobin, Roth & Zimmermann, 2001). When evaluated in terms of the

school's discipline tactics, codes for student behavior, assessment procedures and the expected/rewarded teaching habitus, African American students' cultural resources (i.e. language patterns, common values, ethics, morals, aspirations, beliefs, goals, and social behaviors [including practices, many of which are unconscious]) are often viewed as deficient, non-desirable and deviant from the main school culture (Brickhouse & Potter, 2001). MacLeod (1995) points out: "the problem is not that lower-class children are inferior in some way; the problem is that by *the definition and standards* of the school, they consistently are evaluated as deficient" (p. 100).

Let their voices ring.

It is indispensable that, in becoming progressive, the school system know and value the knowledge of class, and the experience-based knowledge the child brings to it. It is important that the school respect and accept certain progressive methods for knowing things, which are almost always at odds with scientific patterns, but which lead to the same results. (Freire, 1993, p. 41)

In their work with African American, inner city, high school students, Seiler, Tobin and Sokolic (2001) attempted to bring the voices of these students into the science classroom by enacting a curriculum designed to actively engage students' cultural capital in the construction of meaningful knowledge. Results from the study reveal that students typically defined as unsuccessful in school can, in fact, engage in science-like discourse. Building upon such research findings, this dissertation study addresses how the incorporation of students' cultural capital into science teaching can not only help them learn but also provide them with greater opportunities for exercising agency on a societal level. The identification of elements of students' cultural capital that deter from their learning of science also occurs.

Culture as Systems of Symbols and Meanings and Systems of Practices

Similar to a tree rooted within the earth, social actions and interactions involved in the teaching and learning of science in inner city schools can not be divorced from the cultural context in which they occur. In this study, culture is theoretically conceived as both a *system of symbols and meanings* and a *system of practice* (Sewell, 1999). Culture as a system of practice refers to activities that include conscious actions, power relationships, struggle, opposition and change. Within a school culture, practical activities could include teaching practices, discipline procedures, power relationships between teachers and students or resistive behaviors by students. When individuals engage in a particular cultural practice, they use cultural symbols to accomplish it. These symbols have specific meanings based on their relationships with other symbols, and would not exist without the practices that either reproduce or possibly transform them. For example, in an elementary school, symbols associated with a teacher's classroom discipline practices may be a poster listing the rules, token sheets, and classroom candy jars. However, if while allowing a student to have a piece of candy as reinforcement, he/she mentions that sugar will ruin his/her teeth, the symbol of candy as a means of positive reinforcement may be questioned by the teacher, eventually resulting in use of a different symbol. On the other hand, in an urban high school, metal detectors, drug dogs, detention rooms, security guards/hall monitors and suspension forms may be symbols associated with the school's discipline practices. However, if a student decides to sue the school district for invasion of privacy during a backpack search, the school might thereafter engage in different practices to monitor for weapons. In the dialectical nature

of culture, symbols and practices inform one another; thus, culture can be perceived as a fluid and transformational dimension of life rather than a rigid and static one. With this perception of culture, it is easy to envision schools as sites from which societal transformation begins.

Cultures are Structured

Informing both the systems of symbols and practices of any particular culture are *structures* (Sewell, 1992). Structures can be described as *schemas* and sets of *resources* that mutually sustain each other to either empower or constrain social/cultural actions. Schemas refer to rules, procedures, and/or ideas that are generalizable and contribute to either the production or reproduction of social life (Giddens, 1984). Resources are both human and nonhuman, ranging from knowledge or physical strength to manufactured or naturally occurring objects. Sewell (1992) describes the dialectical relationship of schemas and resources.

Schemas not empowered or regenerated by resources would eventually be abandoned and forgotten, just as resources without cultural schemas to direct their use would eventually dissipate and decay. Sets of schemas and resources may properly be said to constitute structures only when they mutually imply and sustain each other over time. (p. 13)

The *achievement ideology* is a dominant schema structuring mainstream American culture (MacLeod, 1995). Ingrained within the political, social, economical and educational structures of this nation, the achievement ideology proclaims that individual merit is what makes the difference. Translated into school cultures, students

are taught to behave, work hard and get the right grades. The ultimate reward is a good paying job and financial success.

Rana: The idea that...you...say you and a white kid graduate from high school at the same time and you've taken the same classes, do you think you're gonna have an equal opportunity at jobs or colleges or what not once you get your diploma? Do you think you're diploma is gonna give you something, the high school diploma is gonna give you success in the future?

Tim: Yeah, I believe every high school diploma gonna give you success. No matter who you are, if you have a high school diploma then you gonna see success. If it took you like six years to get a high school diploma then I don't think so but if you flew right past and got good grades and your high school diploma and you got a good lookin' resume and good reference then yeah you have equal opportunity anything after high school. (3/7/01)

In the long run, an individual operating under the achievement ideology can only blame him/herself for an unsuccessful career resulting in a life of poverty. Students from “subcultures” do often blame themselves. Like the Brothers in MacLeod’s study, some students deeply internalize the achievement ideology so that the inability to succeed in school is viewed as a problem of not being good enough. Failure becomes a personal issue and students start to accept the very norms and standards that contribute to their class positions. Examples of resources sustaining the achievement schema are the national and state achievement tests for determining an individual’s academic merit. High student performance on the exams opens doors of opportunity; whereas, for low student performance, those same doors are tightly sealed. Ivory realizes that such reinforced structures of the education system are frightening, when she expresses, “I’m not a good test taker and I’m afraid that I’m gonna try to get into college -- I’m gonna get a basketball college, but I’m afraid I ain’t gonna get into the kind of college... I’m afraid” (7/9/01).

The Transformational Nature of Structured Cultures

Agency. Since the very actions that are enabled or restricted by structures tend to reproduce them, it is easy to understand how a structure, such as the achievement schema and its reinforcing resources, plays an important role in legitimizing social class disparities and reproducing a culture that favors the upper class. However, when the structures of a specific culture, such as the school culture, marginalize others--in this case, African American inner city high school students--those structures can and should be transformed. Referring to the ability of an individual to exert direction over social actions and interactions (Sewell, 1992), the concept of *agency* is crucial to a study concerned with interrupting the reproduction of social stratification.

To understand the dramatic affect that an agent can have upon existing cultures, imagine an avalanche that was triggered years before by tiny earthworms wiggling through the soil of a firm mountain. Through agency, cultural schemas can be “loosened” when sets of resources are used in new or unique ways so that the original schemas that directed their use are not reinforced. The new schemas resulting from this remobilization of resources can then be applied to a variety of contexts and situations. How then can an individual become an agent? How can one empower him/herself to enable new schemas and resources? The answer is two-fold. First, it is necessary to understand the existing schemas and how they may be oppressive. Second, the available resources should be viewed with ingenuity. It is through the transposition of schemas and remobilization of resources that old structures can be transformed and the process of reproduction can be hindered in its tracks as long as a person is aware of the repressive

aspects of the structures and recognizes a need to change them.

How agency is limited. The level of agency that an individual can exercise within a particular culture/community is strongly linked to his/her knowledge of schemas, for that in turn affects the kinds and amounts of resources that can be accessed. For example, consider the linguistic structures informing school culture. A student who has a firm understanding of formal grammatical rules and procedures (schemas), will be able to access written forms of information as well as communicate in ways honored by the larger society with greater ease than a student who does not. With access to literacy, he/she can then begin to use the resources of reading and writing to transform the structure of linguistics in schools. For example, that student may one day become a researcher who is a prolific writer on the value of different linguistic styles. Those theories may then be taught in teacher education programs and included in national policy, eventually reaching schools to slightly alter the linguistic structures informing school practices.

The social *habitus* (i.e. Bourdieu, 1990; Roth & Tobin, in press) of a student plays an important role in determining his/her knowledge of cultural schemas. Depending upon one's habitus, an individual may be more or less equipped to engage in behaviors leading to effective agency. Habitus is formed by "being-in" the world. Thus, these sets of dispositions--that are more unconscious, taken for granted, simply make sense and feel normal to an individual--embody the structures informing cultures within society. Social habitus consisting of structured dispositions (Lave, 1988) is a historical and biographical product (Grimmett, 2000). More specifically, habitus is a function of social class, family,

ethnicity, educational history, peer associations, and demographics (MacLeod, 1995).

Directly related to their social habitus, urban African American students' knowledge of schemas and access to resources differs from students who come from a social habitus characteristic of the dominant culture. The result: less opportunity to exercise agency in their classrooms and increasingly less opportunity in their schools, neighborhoods, cities and the larger society (Seiler, 2001b). Often, in an effort to exhibit agency, individuals of a subculture/subhabitus engage in oppositional actions that only lead to further entrapment within the dominant culture (MacLeod, 1995). For instance, when the Hallway Hangers became slightly cognizant that certain schemas like the achievement ideology were contributing to their marginalization in school, they engaged in strongly oppositional behaviors to protest the mainstream culture. In their case, and in the case of many students in urban high schools, efforts to exercise student agency through disrespecting teachers, cutting classes, or violence, for example, have led to the further development of an underclass. Unfortunately, students have accepted their status as the "problem kids" and, limited by their social habitus or what feels normal to them, they are restrained to original class position and social hegemonic structures. Therefore, while every individual is born with the potential to exercise agency, social circumstances provide very different opportunities. How then can a student take charge of his/her life? How can one engage "the capacity to position oneself in a way that will provide advantage" (Seiler, 2001b)?

Cultural capital as a catalyst. Ranging from simply style of dress or mannerisms to complexities such as social interaction patterns and linguistic abilities, a

student's cultural capital arises from his/her social habitus. By valuing African American's cultural capital in schools, students will have greater opportunities for building knowledge schemas that will enable greater access to a range of resources. Thus, cultural capital provides a pathway leading to student agency within schools. Moreover, with cultural capital acting as a catalyst, African American's social habitus can become an enabling entryway into society. This study concentrates on understanding the origins of cultural resources that arrive with urban African American youth when they enter high school classrooms. In addition, the study identifies how these resources contribute and deter from physics learning and finally, how student agency is affected when the five students' cultural capital was incorporated.

From agency in classrooms to agency in society. It is important to communicate that agency will look very different depending upon the level of society or type of culture in which it is exercised. For example, while a student may exercise agency by creatively utilizing classroom resources to design a filter to improve the quality of the drinking water in the school water fountains, this does not mean the same student would be able to exercise similar agency to develop large-scale solutions for the quality of drinking water in his/her neighborhood. In fact, in trying to take matters into his/her own hands and exercise similar agency on the neighborhood level, this same student might decide to break a water main versus designing a filter. Within both the communities of school and neighborhood, this student would be attempting to affect change, yet one would result in productive agency and the other would seem counterproductive. Whereas, taking a proactive step and investing personal time and

effort in the school culture was productive, in a neighborhood where utility companies are known to rarely visit unless something is broken, a proactive step would be expected to take a destructive form. Clearly, agency takes many very different faces at different levels of society.

Conclusion

Oh May my May

We shape our buildings. Thereafter, our buildings shape us. -- Le Corbusier

Our social world can be viewed as a vast matrix of interconnected, overlapping, intermeshed structured cultures that shape and are shaped by the social actions and interactions occurring in society. While many factors contribute to the persistence of poverty cycles among African Americans in American urban centers, there is great hope for societal improvement through social class mobility if teaching and learning are understood as phenomena that either produce or reproduce culture. Moreover, exercising agency within structured cultures is crucial to the interception and transformation of such cultural reproduction.

In an email written by May (personal communication, June, 2001), she indicated great potential for exercising agency within an urban classroom when, for an English project, she rewrote a poem by Walt Whitman, "Oh captain my captain" according to the same stanzas and meter beat.

Oh April my April May is almost
here your showers bring flowers
for the middle of the year

your so pretty your air so clear
oh april, april, april your times almost here.

Oh April my April what will you do
your month your days will shrivel
like a shoe, you've added these beautiful
flowers that will probably bring tears

Oh April my April your
time is almost here

Oh April my April it was fun having
you here, your flowers bring flowers
for the bees to rip and tear

Oh April you shouldn't have to
go but it's only fair that may
gets a chance to flow don't get
mad and don't be sad you'll be here

to shed more tears, just
wait 'til next year oh April
my April your time is almost here.

Although beautifully written, throughout the poem, May utilizes her literary resources to reinforce existing linguistic schemas regarding rhythm and meter. In many ways, this poem symbolically indicates the way structures hold African American students and prevent their agency. By being constrained to an outside standard--a poet of the dominant culture, rather than engaging her own cultural capital regarding rhythm and meter into her poetry writing, May has lost an opportunity to connect school culture to home culture.

It's time to integrate the lifeworlds of inner city African American students into

mainstream society. Their social habitus and cultural capital should not be swept aside or regarded as extra baggage that should be discarded. Through the physics teaching and learning that occurred within this study, as well as their work as researchers, teacher educators and curriculum developers, May and her peers had opportunities to utilize their cultural capital to build new knowledge schemas and to develop access to new resources. Oh May my May, your time has arrived.

CHAPTER III

METHODOLOGY

Introduction

Today we watched one-fourth of the movie Men of Honor. That was a good movie but I don't see the reason why we couldn't watch the whole movie. That was very stupid. But anyways we watched the one-fourth Men of Honor and we had to answer these ridiculously stupid questions. We had to answer questions like what happens in this scene and the stupid thing about it was Rana didn't want to tell us exactly which part. ... Another question was, "What happens to Sunday and why?" The real question should have been. "After the second attempt to save a pilot without a suit, what happens to Sunday?" You see these are examples of bullshit questions. A.K.A. lazy questions. (Tim, personal communication, 6/18/01)

Today we finished up the facts of sound tape. We practiced more on making waves. We had pretty much alot of fun making the video. Three things I like about the DŪS. One thing is we're learning number two is we're having fun while doing it and number three is we're doing almost all the things we like and getting paid for it. (May, personal communication, 7/13/01)

My thoughts about what we did in the lab are. That I did like it bout [but] it was only for [four] objects to play around with. But when I say play around with I really mean it wasn't a lot of things to work with. Becouse [Because] after a wow [while] we get tire [tired] of playing with the some [same] object over in [and] over again. So it get a little out of hands at that point. So that why we said it wisest [wasn't] that fun. (Randy, personal communication, 7/30/01)

In a country that has, in many ways, failed to afford inner city African American youth a voice in society, this study provided Tim, Shakeem, May, Ivory and Randy with

opportunities to participate in a research process that encourages participatory critique, empowerment, transformation and social justice (Pizarro, 1998). This study centered on these five students as they acted as learners, student-researchers, curriculum developers and ultimately, teacher educators. The above excerpts from student journals, emails, and research logs consist of powerful, critical and intensive perspectives; hence, demonstrating the power of conducting urban studies which embrace a research methodology that lifts rather than silences urban youth. I chose to start this chapter with a range of DŪS perspectives from this summer project, to empower their perspectives as central to the research process.

Critical Ethnography as a Political Approach to Research

Considering the political context of urban education with oppressive structures informing cultural practices, it would be impracticable to engage a research methodology that is not also, in a sense, political. In fact, a very appropriate research methodology for a study focusing on identifying, critiquing and transforming inequities within urban science education--particularly from the perspective of those who are oppressed--is *critical ethnography* (Barton, 2001). As explained by Seiler (2001b), “Critical ethnography is concerned with unmasking dominant social constructions and their interests, studying society with the goal of transforming it, and freeing individuals from sources of domination and repression.” Barton (2001b) provides greater detail of this type of participatory research:

- it is based on a social constructivist epistemology;

- it permits many different perspectives to influence the research process. In particular participatory research values the perspective of the insider and those whose perspectives have historically been silenced. Indeed, it is grounded in the lives of those involved in the process, drawing on their cultures, traditions, and histories;
- it involves both the “researchers” and the “research subjects” in the research process as co-participants and co-contributors to the research process;
- it is a reflexive, dynamic, spiralling process, organic and responsive in nature;
- its purposes and goals are to promote, endorse, and support shared ownership of both the questions raised and the conclusions drawn during the research; and
- it is centrally focused on making conditions better for the research participants.

This critical ethnography concentrates on understanding how cultural symbols and practices from contexts outside of school affected May’s, Ivory’s, Shakeem’s, Randy’s and Tim’s learning of physics in a school-like context. Furthermore, since the results of critical ethnography call for specific actions to help transform inequitable structures, this study also addresses how the incorporation of students’ cultural capital into science teaching can not only help them learn but also provides them with greater opportunities for exercising agency on a societal level. In order to actively learn about the students’ social habitus and cultural capital, as well as their learning process and representation of science knowing, this study utilizes participatory methods based on a social constructivist epistemology that have some groundings in interpretive research, such as fourth generation evaluation (Guba & Lincoln, 1989). However, this study departs from a methodology focused purely on negotiating socially constructed meanings of the world, for such an approach is informed by theoretical frameworks that view culture as coherent, cohesive, and “more or less uniform, pre-determined, and agreed upon” (Seiler, 2001b). More specifically, although fourth generation methods actively

seek contradictions by selecting stakeholders as dialectically opposite as possible, these contradictions undergo a highly negotiated process to reach a consensus stage and become shared meanings. In this research, culture is defined differently in that cultural systems are viewed as having weak boundaries that allow for a mixture of patterns of thin coherence and contradictions to coexist dialectically within a research setting (Sewell, 1992, 1999; Swidler, 1986). Whenever culture was produced or reproduced and whenever culture was enacted, I searched for patterns of coherence and contradictions and endeavored to relate what I experienced to the teaching and learning of science. Furthermore, I did not look only for cultural practices to be reproduced but also in their re-enactment to be transformed since cultural production, reproduction and transformation were seen also as coexisting in dialectical relationships. Because of the weak boundaries of the science classroom, I expected students to enact culture from other fields in which they lived. Indeed, a focus of this study was on the identification of the strategies of action associated with student practices and the extent to which they afforded the learning of science. Efforts were made to ascertain where these strategies of action were most appropriate and what signs cued them, as relevant to practice, during moments when I expected science to be learned.

The Social Construction of Research Understandings

In critical ethnography “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; Atwater, 1996). In this study, constructions of research understandings are social creations that

were profoundly impacted by the dynamics of the research team. Thus, *who* was involved in the teaching and learning process as well as in the research data collection and analysis stages were extremely important.

The five DŪS youth. May, Ivory, Shakeem, Randy and Tim were selected to be involved in the study through a process of purposeful, dialectical selection (Guba & Lincoln, 1989) in that they represented the extreme ends of the continuum of urban students. The students were selected by people who were part of their school community and had known them over an extended period of time -- their small learning community director and Rana who had been their student teacher during their ninth grade year. Although all five of the teens were considered “at risk,” they were each positioned differently within the margins of social space. Hence, they brought to the research setting rich perspectives, talents, and practices that revealed the cultural influences in their lives. While Ivory, Tim and Shakeem were most outspoken and their opinions were more easily determined, May and Randy were quieter and sometimes required one on one interactions to hear them above the others. Even though some of the teens required more time or different approaches than others, May, Ivory, Shakeem, Randy and Tim all provided helpful feedback, clear perceptions and emotionally intense opinions regarding the study.

“Research With” Versus “Research On” –Evolving Roles

The inclusion of students as researchers in our studies has made a very striking difference in what we study and how we study it. (Cath Milne, personal communication, 10/8/01)

Critical ethnography calls for a research process that abolishes the hierarchy typically associated with traditional research methodologies (i.e. research performed “on”

or “for” a particular group) through researching “with” rather than “on” the researched community. In addition, researchers should act as “subjective partners with stakeholders⁸ in the literal creation of data” (Guba & Lincoln, 1989, p. 45). During this study, the numerous roles held by me as well as the youth presented challenges in maintaining a balanced image of what occurred and what meanings we built throughout the study.

In fact, at the start of the study, I had anticipated that natural power hierarchies would arise between me and the students as co-researchers, due in part to my appearance of being White, my level of education, and the typical expectations students exhibit for a teacher. I did not seek to encourage such power relationships and rather I wanted to nurture genuine and mutual respect. Consequently, it was imperative that each stakeholder held a powerful voice in the research process so that no one person’s voice silenced another’s. Traditionally, the tendency has been for the researcher to drown out the voices of other stakeholders, particularly due to the power attributed to the researcher position. Seiler (2001b) urges a movement beyond such hegemonic research practices when she writes, “Our institutional practices and traditions in social research perpetuate unequal power relations between the researcher and the researched. Thus we must find ways to transform the differential power relations between participants as well as those implicit within the social setting itself.” In this study, since May, Ivory, Shakeem, Randy and Tim were both learners and co-researchers, and I was both teacher and researcher, interesting dynamics resulted. While we were able to establish a certain level of equality as fellow researchers, the teacher/student relationship evolved differently, and the

⁸ The term stakeholder indicates that those involved in the research have powerful roles in the process.

following section offers descriptive details supporting such a claim.

The teacher/researcher dynamic. *The first week of working with DŪS in Philadelphia, rather than from a distance in Florida, proved to be one of the most challenging. When I left the university on Friday, July 13th, it was all I could do to keep from sitting down and weeping; I felt quite frustrated and perhaps somewhat like a failure. I had just finished a meeting with Akram and Rana, in which fuel had been added to my already burning fire of confusion regarding the balance of my roles of teacher and researcher. The fact was that I had chosen to forefront my role as researcher within the DŪS research environment and in accordance with my methodology, I wanted to provide May, Ivory, Shakeem, Randy and Tim with voice and responsibility and treat them as young adults involved in important research that could potentially change their lives. Yet in the process, I had become perceived as a “weak” teacher, or one without authority, by at least Akram, Shakeem and Ivory⁹. Reflecting back, I could see how this occurred. Basically, I had not succeeded in having the DŪS group view me as primarily a researcher, rather than a teacher, or view themselves as individuals helping me to research their learning process. That day, in particular, had been quite horrible. My lesson on wave reflection, construction, destruction, standing waves, nodes, antinodes had not gone well, to say the least. I was trying to engage the students by having them hold ends of a long rope and then a plastic slinky to experiment how different frequencies of hand movement could result in different standing wave patterns. I was utilizing these manipulatives to encourage science discourse development*

⁹ On July 13, 2001, while video editing with Akram, Shakeem and Ebony expressed their opinions regarding the week, which Akram shared with me during our research meeting.

among the group. Tim and Randy participated (but not too enthusiastically) while May sat in a corner, Ivory left her earphones on and Shakeem was videotaping the disastrous lesson. I decided to stop the lesson. I began to think that the rapport between the students and me needed some definite rearrangement, so I decided to have Shakeem interview me in front of the group. Although this captured the group's attention for a few minutes, after we finished, the situation became progressively worse with Randy dozing in his chair, Shakeem was waltzing around the room, May on the computer and Ivory still wearing her headphones. I could just see that they were waiting for me to take control and give them orders, and I was fighting that direction of action. Honestly, it would have been so easy for me to step in and snap them all back into line. I simply had to bark out a couple of orders, direct them to different locations and instruct them to do any range of activities, such as journal writing, internet research on physics topics covered, or to type out their sound skits. I had seen Akram do it many times and I knew I could be almost as effective. They would probably be shocked into listening, and if not, I would simply have informed them that they would either cooperate or not return to work the following day. I didn't know what to do. I did not want to set up such power barriers between us. Yet, I began to feel that no matter what, as long as I was teaching science, my role as teacher would take precedence, and their expectations for me as a teacher would revolve around my ability to establish a power relationship typical of teachers and students in urban schools. Although I had expected some challenges in teaching, I was not prepared for this!

Although difficult at times, I learned to accept that the research process would be

an evolving one with unanticipated challenges and changes, particularly in response to the needs of those involved in the research. As a result, I adapted some of my teaching strategies to provide more structure and direction for learning activities, yet my verbal interactions with the students were consistent with my goal of treating them as equal partners as we embarked together on a journey of research. In addition, I was careful to take specific actions that would demonstrate my level of sincerity by making a concerted effort to be responsive to feedback on the research environment, curriculum development activities and particularly on the teaching/learning process. For example, when some of the students expressed discomfort regarding the number (50) of sound facts to present in their movie, I modified the list to be more manageable and focused. Another example occurred during an interview/research debriefing meeting where Randy, May, and Tim expressed their views on writing and performing skits for their sound movie. Parts of the discussion are below:

- Row: So I'm still confused, I don't know what I should do different or what I should do more of. I don't know, like--
- Randy: I really don't wanna do that um skits.
- Row: You don't wanna do the skits?
- Randy: I really don't feel like doin' them.
- Row: Did you want to do it in the beginning?
- Randy: I did, but now we done did them other jawn¹⁰. I really don't feel like goin' through them skits.
- May: I never did want to do the skits. ...
- Row: I want you to believe me when I say I'm really listening to you guys. ... So you say, you don't like the skits thing because you don't really feel like you're into it. Say, say like I cut it down and I said well instead of having to do five skits, choose like your favorite one. ... Would you feel better?
- Randy: Yo, I don't feel like doin' that yo.
- Row: Well what if we cut down the number?
- May: That would be better.

¹⁰ Jawn is similar in meaning to the slang word, "stuff".

Randy: But I won't feel like doin' it. Getting all that stuff together.
Row: Well, tell me what do you feel like doing?
Randy: I'll do something different. But not...
Row: Well tell me what—see we can do different things. I just need to know your ideas, though. Cause the only thing we can't do is we can't just sit around doing nothing... So would you rather do the science in a different way than doing the skits? Cause you say you don't want to do the skits? How do you like to do the science?

As the summer progressed and I built rapport and relationships with the DŪS youth, the teacher/student dynamic became less problematic. The following excerpt from an education seminar in September that featured Shakeem, Ivory and May as guest presenters provides insight into the researcher relationship that developed throughout the summer.

Keem: In high school there's a lot of people who are, let's say, above you and it's like here we're all equals. Of course I'm not an adult, but if I have an opinion it's heard and most likely... At school if you tell your teacher, "I got an opinion," most likely they'll say, "OK we're gonna get to it." But most likely it never get done. So I think that since everybody is like on the same level [here], it's a lot easier to communicate. Like everyone listens here and in school no. I didn't know I'd actually be learning, doing video editing til I got here. It just happened. I said OK. I had an opinion, and they said, "OK, we gonna listen to you." So I gave em the opinion. They listened and it worked or... it didn't work, whatever the situation was. It was all on the same level.

Lady¹¹: It seems very unusual to me that that could happen.

Keem: It should happen. It should always, it should happen a lot more. Nobody had any problems this summer. Nobody argued. No one had any disagreements because we talked everything out on a very adult level even though that we're a little younger than y'all. You see, we think a lot just like y'all. We do a lot of the same things as y'all do. ... So I don't know why it seems strange that kids and adults can work on the same level. I think it should be a lot more. Here it's like you knew what you had to do, you knew what you needed to do, so you did it. In school it's like a lot looser. You got everybody else playin' around and they're havin' fun. They're your peers. They're having fun. I wanna have

¹¹ Seminar participant

fun too. Here it's like everybody serious and there's a deadline and you know it gotta get done. We was pretty much in charge here all the time. It's like we was in charge and they was just basically sayin' you've got the power... and we want you to come up with the full potential that you have. Just don't go crazy with the power you got.

In conclusion, although the extent to which equality was achieved could be controversial, many tensions associated with role ambiguity eased over time. On the last day of DŪS, Ivory told me, “You were cool, but you had to get to know us.” Although much more complicated than this summary statement, the essence of her message places relationship, rapport and respect as priorities in a research setting that incorporates a participatory methodology. Surely, the success of a participatory research approach designed to learn about the cultural capital of the stakeholder lies heavily upon the ability of the stakeholders to create open, honest dialogue with each other.

Data Sources

The data sources from which cultural production, reproduction and cultural enactment were studied included audiotapes, videotapes, field notes, journals, and artifacts. According to Erickson (1998), such variety is a necessary characteristic of ethnographic research such as this one.

Looking and asking in a setting can produce differing sources and kinds of data ... field notes written by an observer; interview comments; machine recordings; and site documents, including demographic and historical material. An effective data collection design includes as many of these different sources as possible...”
(p. 1158)

The remainder of this chapter provides a summary regarding the data sources collected

through this study's design. In addition, the significance of utilizing such data resources in this study is discussed and the analysis and interpretation steps are briefly delineated. However, it is important to note that each of the remaining four chapters also includes a methodology section that provides greater detail of the research process specific to that portion of the study.

Audiotaping

Audiotapes constituted a large data source for this study, in that DŪS group interactions were taped, almost consistently, on a daily basis throughout the science-teaching weeks. I was able to capture science-like discussions and students' social conversations during both instructional sessions and the sound movie production process. In addition, throughout the entire summer, interviews were audio recorded. I held frequent interviews -- both informal and formal--with the teens, and in similar manners, they interviewed each other.

As one of their research-related tasks, May, Ivory, Shakeem, Randy and Tim reviewed the audiotape archive and provided a summary of issues that were addressed on the tapes. Although this task was partially organizational, their decisions to describe some events and disregard others indicated what aspects of the research context were salient to them. The following is a summary of a tape reviewed by Ivory.

Ivory sings in the background as Eric talks about the other jobs. I think we are filming, and the rest I can not hear because all I hear is Eminem. And Rowhea saying that the 50 facts we had was a little too much and she broke them down. It was our choice. It was a lot of complaining about where the filming was going to be. She was also talking about how everything sounds different from other things and it has it own sound because of the molecules. And I also hear a lot of songs that's being taped over the voices. (8/10/01)

Often, by using the DŪS audiotape summary as a guide, I decided which tapes I would listen to for transcription purposes. I looked for tapes that seemed to hold evidence of (1) science-like conversations within the group or among individuals, with and without my presence; (2) evidence of the students' cultural tool kits; and (3) cultural elements within the students' lifeworlds. While I transcribed the majority of the tapes, the DŪS members and especially, Shakeem, May and Randy were significantly involved in the process. When they transcribed, I provided broad guidelines to the young researchers. Out of a 90-minute tape, the transcriptions ranged in length from four pages to twelve pages, thus indicating the flexibility of interpretation surrounding guidelines, such as the example provided below.

Please transcribe the sections of this tape where Tim speaks about the following:

- His beliefs about how teachers should teach and learners should learn
- His beliefs about what science is
- He always asks "WHY"
- When he puts in the most effort
- Having people listen to him is important

Whether generated by myself or the youth, audiotape transcriptions were interpreted in ways that led to greater understandings of the cultural resources that arise within the students' home and neighborhood cultures, and how these tools infused the research setting in the form of cultural production, reproduction and enactment during science teaching and learning.

Videotaping

Videotaping transpired throughout the summer--particularly during the weeks in which science instruction was taking place--in order to capture behaviors, social

interactions and conversations indicative of cultural production, reproduction and enactment. Since I was often preoccupied with my teaching, these videotapes complemented the audiotapes in providing me with images of what was occurring within the group dynamics that I might otherwise have missed. Abbas (1997) recognizes the benefits of this 'reviewable' data source:

Through replaying a videotape, the researcher can analyze not only the actions that occur more frequently, but can also re-observe and re-analyze actions ... Such tapes are available to review as many times as necessary without losing discourses and actions that occurred in the classroom. (p. 39)

More specifically, having access to nonverbal behavior through videotapes in addition to the verbal interactions recorded on audiotapes, I was able to identify and develop greater understandings of the detailed subtleties of cultural fields that inform habitus and cultural resources that appeared in the learning environment. For example, these understandings were achieved by searching through May's transcriptions of videotape segments in which discursive science conversations seemed to have been occurring. If the transcription indicated any level of conceptual science talk, with specific attention to the use of canonical discourse, I engaged in microanalyses of conversational style, group dynamics, speech overlap and direct references to cultural aspects of the students' lifeworlds. I also selected particular video segments that I thought represented cultural production, reproduction and enactment and designed accompanying questions for the students to write or talk specifically about the science subject involved and their learning process. In addition, video was used when the students interviewed each other, as well as during the three-tiered ethnography project when Randy and Shakeem recorded video ethnographies of their neighborhoods.

As part of the data analysis stage, I incorporated CVideo©, an annotation software, to view videotapes of the research context, identify salient segments and index them chronologically. I was predominantly interested in utilizing this technology tool to compare situations where the students were involved in the production of their movie, those where they were engaged in science instruction directed by me, and finally, in contexts where the students were in their neighborhoods and homes. I began by recording notes in CVideo© that described, when applicable, student actions and interactions with each other, with neighborhood peers, family members and with Akram and myself. Then, utilizing Sewell's theoretical framework for viewing culture as having weak boundaries, I looked for cultural symbols and practices that were similar and different within the three different situations as well as for evidence of cultural tools that students employed in any of the contexts. In that manner, I learned to identify cultural resources that were commonly engaged across different cultural fields. Being able to view the different research contexts in 'slow motion' provided me with insight into the patterns of thin coherence and contradictions dialectically existing and informed me as to what questions to later ask, as part of a design in which analysis, interpretation and data resource identification and acquisition were recursively interconnected. Further details of video analysis and interpretation are incorporated in chapters four, five and six.

Field Notes/Journals

In order to monitor for consciousness and inner thoughts, both the students (with the exception of Shakeem) and I kept reflective journals describing lived experiences and interactions within the research setting. Although a journal is a powerful tool for

contemplating upon one's feelings and reactions to incidents within a research environment, throughout my presence in the research environment, I made an effort to also write field notes--written observations recorded before, during or after I had interacted with DŪS. These notes were utilized to remember what occurred during science lessons, following an interview with a student-researcher, watching videotapes and listening to audiotapes. The purpose of these notes was twofold, first to provide descriptions of the setting, the people and the actions/interactions and; secondly, to capture the feelings or concerns present (Bogdan & Biklen, 1982).

Artifacts

In addition to journal writings, the artifacts the youth produced as research assistants included transcriptions, raps, census statistics, Internet research, video clips, PowerPoint presentations, interview questions, and the sound movie. Interpretations of these artifacts occurred through a variety of means. For example, many of my interpretations of the ethnographic PowerPoint presentations of Tim, May and Shakeem occurred during their presentation to, and question/answer session with, Graduate School of Education professors and students and high school science teachers. Another example of artifact interpretation can be explained with regard to Internet research in which Ivory engaged. In accordance with her interest in the media coverage of a mass murder in Philadelphia that occurred nearby her neighborhood, Ivory conducted research to find articles about the story. By asking Ivory to record her perceptions regarding information found in the newspaper articles, I learned about her life in western Philadelphia.

I think in the Lex Street case that they still don't have enough information on them four guys that supposed to have did it. ... I also think that in my own

perspectives that if they did do it, they shouldn't just have life in jail. If it was a mass murder all over the city – the worse they had the unfortunes, I think that they should get the death penalty or the electric chair. ...And I also think that-- I also think in the Lex Street case that if they knew it was a bad neighborhood or whatever, they shoulda—I mean the cops be everywhere else. I don't think the cops shoulda took at least a hour just to get there. I think it woulda been-- he woulda lived. I don't think it woulda--I think it woulda been more evidence if—it woulda been at least two lives still alive. Even if they knew. And the people that's on the block, the captain or whatever, she knew that a bad house, a drug house that was goin' on for years with different people. I think they shoulda looked into that more. (Ivory, personal communication, 8/14/01)

Artifacts, such as those mentioned above, were helpful for building an understanding of the overlapping sociocultural worlds of Ivory, Randy, Shakeem, May and Tim. The artifacts became extremely important in searching for a mixture of patterns of thin coherence and contradictions within the research setting, specifically in reference to the teaching and learning of science. In the coming chapters, when particular artifacts informed understandings, greater detail of how they were interpreted is provided.

Judging the Quality of Research

The trustworthiness and authenticity criteria (Guba & Lincoln, 1989) represent two means for judging the quality of research that is not of the positivist paradigm. Although this critical ethnography can be best described as one that has catalytical authenticity, tactical authenticity and transferability, other goodness criterion are also addressed in the following two sections.

Trustworthiness of the Study

In order to ensure the trustworthiness of the study, credibility, dependability,

confirmability, and transferability were considered important as the research process unfolded. At the start of the study, I was worried that the length of time with DŪS would not be enough for me to “overcome the effects of misinformation, distortion, or presented ‘fronts,’ to establish the rapport and build the trust necessary to uncover constructions, and to facilitate immersing oneself in and understanding the context’s culture” (Guba & Lincoln, 1989, p. 237). However, prolonged engagement is a relative term and although a longer time period would have been advantageous, this study will reveal findings that indicate an establishment of rapport and trust with the DŪS members. In fact, due to the multiple roles the students engaged in, there was a variety of contexts in which the youth and I interacted and from which data resources and research findings emerged.

Throughout the summer and following the project’s completion, the credibility of these research findings were confirmed, denied and altered through the member checking process. In addition to keeping track of May, Ivory, Shakeem, Randy and Tim’s thought processes over the summer, it was important to check my own evolving constructions, and this is referred to as progressive subjectivity. By sharing research findings with colleagues, committee members, and the NSF grant research group, I engaged in “peer debriefing” to express my changing constructs and receive feedback that would further sophisticate my thinking processes. Transferability refers to the possibility of this research being transformative for both those involved in it and those who will read it. In the final chapter’s discussion of implications for the study, transferability is addressed in detail.

Authenticity of the Study

During my research with May, Ivory, Shakeem, Tim, and Randy, it was my primary concern that the data collection and analysis would potentially improve their immediate lifeworld conditions. It is through active membership within such a critical study that knowledge of students' schemas can increase (a key to exercising agency) and the students' cultural capital can be better understood for its value. The criteria for ensuring the authenticity of the study are fairness, ontological, educative, catalytic and tactical authenticity (Guba & Lincoln, 1989). The first important element of conducting authentic research is to solicit and subsequently honor stakeholder constructions, which Guba and Lincoln (1989) describe as fairness. The main motivation behind discovering the youth's perceptions was both education and empowerment. Moreover, as I was a partner in the research process, as I learned from May, Ivory, Shakeem, Randy and Tim, my own constructions became more and more sophisticated. This is known as ontological authenticity.

For a study that is concerned with social transformation and student agency, a research process that encourages action and change or catalytic authenticity is extremely important. Moreover, its value becomes even higher if it empowers stakeholders to act and make decisions--tactical authenticity. African American students in urban schools probably know first-hand that "it is quite possible to want, even to need, to act, but to lack the power to do so in any meaningful way" (Guba & Lincoln, 1989, p.250). Chapter six provides findings that demonstrate how this research was somewhat agentic for May, Ivory, Shakeem, Randy and Tim, yet not so much that they will necessarily escape the

vicious cycle of urban poverty and inequities.

Conclusion

From the outside, a tree appears simple and easy to describe-- a sturdy trunk full of lofty branches, covered with crisp green leaves. In a similar way, schools have often been reduced to simply classrooms of teachers teaching and students learning. Yet, when one begins to delve deeply within the culture of schools and attempts to understand the patterns of coherence and contradictions within a structured society, this notion of a neutral education gets set afire. Consequently, educational research must be framed appropriately to make any sense. Critical ethnography provides the much needed politically tinted lens for understanding what is occurring in schools. No longer can researchers look at schools as classrooms full of teachers just teaching and students just learning. In this study, inner-city schools were understood as sites where systems of cultural practices and symbols lead to the oppression of students, particularly ones similar to May, Ivory, Shakeem, Randy and Tim. Therefore during this summer project, I strove to actively involve these five individuals in a research process that allowed them voice and built a sense of empowerment so that social transformation became a viable option for them to consider.

CHAPTER IV

THE ROLE OF CULTURAL CAPITAL IN LEARNING PHYSICS

Introduction

Yo, you ever see something and be like, “Ooh, that’s nasty!” But you never had it before? That’s how it is with the science. It’s like, “Oh, science here we go.” But, then sometimes it might not even be that bad. (Shakeem, personal communication, 7/24/01)

Sometimes, it seems that black ink upon a white page is insufficient to express the strongest type of sentiments. As I’ve tried to write and rewrite this chapter, I have struggled with knowing how to begin and what stories to tell. In many ways, it would be easier to tell a story that is smooth flowing, like a country brook, sterile of struggle and reductive of social complexities. To a certain extent, this is the way in which qualitative studies are often presented--as a cohesive, organized process that simply unfolds according to a specific research plan. Yet, in this study, and particularly in the manner which I choose to present the research findings, I challenge this notion and instead offer images of a research process more aligned with the social construction of knowledge and with the realization that I was not a removed researcher, but rather, an integral member whose interactions with the students, the curriculum, and the resources impacted the

nature of the research process. What results is a chapter that highlights my travels down a winding road in the dark, full of bumps, potholes, puddles and occasional quicksand as I learned to recognize aspects of the cultural capital engaged by the DŪS youth within the learning environment.

The Snapshot with Everything in It

The day I took May, Ivory, Shakeem and Randy to the Penn physics lab was memorable for more reasons than just one. With a retrospect that spans both macro and micro-level analysis, everything that happened throughout the summer essentially occurred on that one day. Shakeem started the day off on the right foot from the moment we walked into the lab. “Where are all the people?” he remarked in a dissatisfied tone. (Later, he wrote: I thought that there would be someone at the lab to teach us about all the machines but nobody was there. That disappointed me from the gate.) “Today’s a really important day”, I explained, “I really need for you guys to help me out”. His response, that was meant to be humorous, worried me: “What if we don’t want to help you out? What if we just want to get paid?” May automatically sat in front of the string lab setup by the door--by herself, while Randy, Ivory and Shakeem gathered around the microphone/oscilloscope lab. Ivory’s head was buried in her watch whose spring had “popped”. No one would budge to come over to the string lab where I had planned to begin. I could tell that that is was going to be a very long day.

Although I didn’t comprehend the magnitude of its importance at the time, July 17, 2001 played a key role in the unfolding nature of this research study. More specifically, the actions and interactions that occurred during the physics lab day were

instrumental to gaining better sociocultural understandings of May, Ivory, Shakeem, Randy and Tim. As the DŪS youth participated in the laboratory setting, I looked for their reactions to the science curriculum, in terms of the cultural tools that they would engage. When I left that experience, I was frustrated and disillusioned, yet later, my videotape and audiotape analyses on the macro and micro-levels revealed patterns of coherence and contradiction, regarding the students' cultural resources, that spanned the entire study. It was not as if, following this date, I suddenly awakened to the brilliant light of momentous understandings. Rather, due to the distress I felt with regard to the teaching I was doing and the learning that was occurring, I examined and re-examined the lab day, looking for subtle meanings that were often as elusive as afternoon rays lightly dancing among grass blades. Thus, this chapter places the physics lab day as central to discussing what occurred while students were "learning" throughout the entire study. It focuses upon identifying cultural capital or strategies of action possessed by May, Ivory, Shakeem, and Randy that infused the physics learning environment and contributed or detracted from the learning that occurred.

Cultural Capital Within a Science Learning Environment

In the course of everyday interactions with the world, we incorporate a wide range of resources (Sewell, 1992) in the form of strategies of action (Swidler, 1986) that are many times unconscious and can be described as habitus (Bourdieu, 1992). The resources we engage emerge from our cultural experiences within various fields. In

trying to understand how to improve the learning of urban, African American students, there is a pressing need for understanding the strategies of action that students bring with them to learning environments and more importantly, how these strategies aid or hinder the teaching/learning process. In this dissertation, the strategies of action that were engaged by the youth are not “conventional in the sense of a plan consciously devised to attain a goal” (Swidler, 1986, p. 277). In contrast, this study seeks to discuss techniques that the youth utilized (consciously or unconsciously) to organize their actions to reach goals that were sometimes aligned with and other times opposed to the goal of learning. Moreover, the ways in which the students organized their actions are considered cultural resources that took the form of attitudes, habits, rituals, language patterns, skills, values, ethics, morals, aspirations, beliefs, goals, and social practices --many of which are taken for granted or are *habitus*.

In the following sections, I present vignettes from the physics lab day featuring May, Ivory, Shakeem, and Randy that reveal different strategies of action that appeared throughout the summer. Within this detailed discussion, findings from other science lessons are also presented to add to the initial cultural understandings.

An Attitude of Determination

Narrative. *The manner in which Ivory interacted with me, the lab tools, and her fellow peers during the physics lab day resembled in many ways her practices throughout the entire summer during any of the science lessons I presented. She often placed what seemed to be all of her energy and attention into anything else but learning science,*

initially. Then almost as an afterthought, if at all, she would participate in the activity(ies). This did not mean, in anyway that Ivory was wasting time; she simply had certain priorities that came first for her. Moreover, there was always purpose in what Ivory did. In the case of the physics lab day, as we walked to the physics building, Ivory's watch broke. She had told me, a few days earlier that she had just been given the watch after a weekend basketball tournament in a nearby city. I understood that the watch held symbolic meaning for her, yet, I was not prepared for how this broken watch would create challenges in the learning environment. Ivory's determination to fix her watch was incredible to observe. For the first hour of the lab, with the exception of maybe 10 minutes, Ivory not engage in any of the lab activities. When I attempted to provide her with an option that would allow both she and I too achieve our goals, her response was curt and challenging.

Ivory: My ice¹² broke. It ain't broke but my spring's popped.

R: So if I promise I'll get it fixed for you after, will you do it later?

Ivory: LATER? What are you talkin' about!!?

I took the approach that I tended to take with Ivory throughout our work together, I left her alone for a period of time and even supported her efforts to fix the watch by allowing her to go to a nearby office to borrow glue and scissors. However, finally as I didn't see her coming to meet me halfway, I gave her a five minute ultimatum, at the end of which, I expected her to be actively interacting with one of the labs.

¹² Ivory refers to her watch as "ice".

Ivory's watch represented a distinct cultural symbol, the meaning of which seemed to be interconnected with her status and identity. The goal of fixing the watch then took precedence over the goal of learning. In order to accomplish her immediate goal, Ivory engaged her cultural resource of determination, diligence, or an unyielding attitude. In an interview with Shakeem, she alludes to such a cultural strategy, "I would describe myself – talented, smart, hardworking. ... I got talent in mostly anything. I got talent in playin' instruments. I got talent like in basketball. I got talent in like track, singin', rappin'. I can do basically anything."

That was not the first nor the last time Ivory's resolute approach to life appeared within the DUS environment as helpful for her personal goals, but a deterrent to learning. During one of my science lessons when the group should have been experimenting with the sound can telephones and engaging in science-like conversations with each other and with me, Ivory sat apart from the group and spent her time on the internet searching for basketball camps. When she showed no sign of getting up, I asked her, "Don't you want to try, Ivory?" "I'm about to try it," she responded, but she never participated in that lesson. Immediately following the lesson, I interviewed Ivory.

Row: And then how about, just like in the afternoon, like the stuff with the cans. Did you feel like it was kind of babyish?

Ivory: No.

Row: No? Cuz, I was thinking that maybe like you didn't really like it? Um, and that's why you weren't really getting involved?

Ivory: (Quiet. Hums a little.)

Row: Was there any special reason why you didn't get up and do it?

Ivory: Yeah.

Row: Yeah.

Ivory: I was lookin' up camps. Basketball camps.

Row: Oh, basketball camps.

Ivory: And I was sendin' these flyers for 'em.

Row: Oh, what are you gonna do with it? You're gonna go to a camp for the summer?

Ivory: Yeah, I'm a try to go to like um an overnight camp or something.

Row: What do you do? I didn't know about that. Tell me about basketball camps. How do they work?

Ivory: It's some day camps and night camps. Some camps you just stay the whole summer and play and basically camps you go swimmin', basketball. There's just some basketball camps. They're just activity camps.

Row: Is it like especially for people who are really good in basketball?

Ivory: No it could be for anybody. ...

Row: Oh. So are you thinking about doing that right now with a summer camp?

Ivory: That's why I had to um read. Cause most of them I'm gonna pass, they already old like they already passed or they comin' up, and I can't do it anymore. They got one camp, it's um--I think it's a week camp. They say for all the point camps. They said for all the point guards from another game ...

Row: You're gonna be a point guard now?

Ivory: Yeah, I been a point guard.

Row: You've been a point guard, so wait. A point guard s--

Ivory: the one who take out the ball, take down the ball. Dribble.

Row: Are you like one of the main defense players?

Ivory: Umhmm

Row: And so you're the one who makes a lot of the shots.

Ivory: I'm the one who set up the plays. You see 76ers play.

The interview helped to distinguish basketball as Ivory's highest priority; thus, for her, it seemed to be a completely rational decision to engage her cultural tools first and foremost to better her basketball skills. However, Ivory's attitude of determination posed real challenges for me when she was not focused on learning science.

Determined to learn physics. There was only about 20 minutes left before we would leave the physics lab, and I was trying to elicit a discussion with Shakeem and Ivory regarding the open water pipe lab. We were identifying when high and low amplitudes could be heard as the water valve was moved in a vertical direction. On the

board, I listed the different centimeter readings for the locations where the students thought they heard a difference in sound: 12 high, 20 low, 32 high, 62 high.

As I tried to encourage their development of a visual model that fit with their auditory observations, Ivory strongly recommended that I write down the main points on the board. “You’re not supposed to keep saying the same things over and over” she said. Then, suddenly, Ivory decided to take on her suggested role, and she went to the blackboard and started to draw what she thought would demonstrate the wave pattern inside the vertically standing water pipe. As she began, I knew she was finally getting engaged in the learning process. Her determination was visible through her facial expressions, body language and verbal comments as she painstakingly drew a horizontal line, divided it into tenths, and tried to plot the points of high and low so as to represent crests and troughs of a translational wave. After presenting her “graph-like” idea, Ivory switched over to an explanation that discussed standing waves, antinodes and nodes, amplitude, energy and wave reflection. Two weeks later, Ivory watched herself on videotape and wrote, “I also think I would be the most one to learn also because after I think about what I had did. It something that will not leave me because it something that I had put progress in.” May wrote about the success of Ivory’s teaching moments, and indicated the role that Ivory’s determination to explain the water pipe lab contributed to her own learning process (i.e., to May’s learning).

I think she [Ivory] explained the second one better because I was kind of confused on the first explanation. I think that me and her was confused cause I didn’t quite get it very well, but on the second one were [where] she sort of broke it down a little I got the hang of it. Plus I think that, that’s what is really going on inside the tube.

This section illustrates the dual role that students' strategies of action can play within a learning environment. As cultures are weakly bounded (Sewell, 1999), it is highly possible that students' will engage strategies of action to pursue goals that arise from different fields of life separate from the environment in which the learning of science is the object. In such cases, the teacher sometimes interpret the cultural capital of the student as a negative attribute; whereas, if channeled successfully, the cultural resource can contribute to the student's learning process in extremely beneficial ways.

Intense Confrontational Interaction Styles During the Learning Process

Confrontational interactions between students as well as between students and teachers have become accepted aspects of American schools and instances of occurrence are highest in schools in which the majority of students carry this strategy of action within their cultural toolkits. In my experiences with the DŪS youth, I became increasingly aware that Shakeem and Ivory relied on this assertive strategy or mannerism for a wide range of activities that included, but were not limited to, social interactions with myself, peers and other adults. Confrontational strategies were thus visible throughout the learning experiences of the group, and a prime example occurred on the infamous physics lab day. The following narrative has been written using audio tape and videotape transcriptions as well as microanalyses of the video segment on the level of a tenth of a second.

Narrative. *For much of the day, May, Ivory, Randy and Shakeem had been working alone. I moved to the different lab setups to work with the teens, one by one. After Ivory and I had played with the microphone lab setup, I asked her to join May at*

the string lab so that the three of us could discuss the string lab and its connection with the microphone lab. Shakeem sauntered over within minutes, and so I found myself working with everyone except Randy. This interaction demonstrated intense group dynamics in which Ivory and Shakeem engaged in learning about nodes and antinodes through a confrontational mechanism. May occasionally joined in, yet in a manner that was less passionate or threatening than either Ivory or Shakeem. The interaction was instigated through my goal of introducing the variable of tension into Melde's experiment on stationary waves. My original question was designed to encourage students to hypothesize what would happen when weights were added to the string apparatus, yet a gesture misunderstanding led to a heated disagreement.

Row: What do you think's gonna happen, when I put on the weight? Shakeem, what do you think's gonna happen when—

Keem: Huh?

Ivory: It's heavy so it's going to stay there. ... And that's what's going on.

Keem: Yeah

Row: Do you think this is going to change? How many waves—

May: I think it's going to stand still.

Ivory: It's heavy. It add weight to it, so it's gonna stand.

In order to generate more specific hypotheses, I tried to direct May, Ivory and Shakeem's attention to the number of antinodes on the string. While May, Ivory and I naturally saw the antinodes as more salient to count, Shakeem unconsciously tallied the nodes, instead.

Row: So how many we got now? One, two, three, four. (*I point to each antinode on the string as I count*) Four crests, right?

Keem: No. (*Conflict approach engaged*)

Row: Four antinodes

Keem: One, two, three. (*Shakeem points to the nodes rather than antinodes yet I miss his gesturing because I have knelt down temporarily so as to add weights to the hanger part of the apparatus*)

Ivory: Four. (*Ivory enters the disagreement.*)

May: It's four. (*May enters as well.*)

Keem: Erick tole me it's three.
 Row: You want to count how many wavelengths? You count--
 Ivory: Arright Shakeem. This is a wavelength.
 Row: So there's one, two of these. (*I symbolically divide the string with my hand so that each half has two antinodes and a node, and I make a sweeping gesture across the wavelength. Shakeem misses my hand motion. He's rubbing his head with his eyes closed due to a headache.*)
 Ivory: There's four. Shakeem knows it's four, you don't have to explain yourself.
 Row: (*I assume that Ivory is correct and Shakeem is on the same page with us now.*) So how many wavelengths is that?
 Keem: Three. One, two, three (pause) four. (*He is pointing to the antinodes this time.*)
 Row: A wavelength is from the top of one to the top of the other.
 Keem: Hold up. Oh, that's one, two, (*He is now pointing at the nodes again*)
 Ivory: Shakeem is not retarded.
 Keem: three.
 Ivory: You don't have to explain it to him.

I was rather thrown off by the discussion that was unfolding. Although Shakeem had gestured twice as he counted three nodes, my goal to discuss how tension of the string affected the standing wave patterns had distracted me from paying careful attention to how Shakeem's gestures and verbal expressions coincided. As a result, Shakeem's confrontational strategy quickly intensified, and there became a noticeable shift from a calm disagreement to a potentially explosive situation.

Keem: An' if you go there (*points to the end of the string that is attached to the vibrator support*), ain't no other one [node]. So it's three like I said!!
 (*Smacks Ivory on the back of her head*)
 May: One, two, three, four (*May points, lightly touching, the four antinodes on the string. Shakeem misses her gesturing except for last antinode.*)
 Ivory: It's four, Shakeem!
 Keem: (*He bellows now, directing his comment to May*) No, you asshole!
 Ivory: Shakeem.
 Keem: That one don't count! (*He explicitly points to the end of the apparatus where the string extends over the pulley and a node seems present.*)

Ivory: Yes it do! One (*Ivory starts counting at the antinode closest to the pulley end and holds the string momentarily at each of the antinodes.*)
Keem: (*Voices rise and Shakeem's attitude becomes more and more intense*)
Damn it!! Shut up! UhUh! UhUh!
Ivory: two, three, four.
Keem: Ya'll motha fu**ers have gotten me started. Look at this. Look. I'll touch it for you. (*Shakeem's tries to hit Ivory's hand away from the string where she is counting the antinodes. The string falls off the vibrator once again.*) See.
Ivory: See.
Keem: (*Looks at me as I shake my head in disbelief.*) No. She did that that time.
Ivory: I ain't do that.
Keem: I swear to God I didn't do that. I ain't touch it, man. ...
Row: (*Once again, I connect the string to the vibrating support.*) So we got—we agree it's four?
Keem: No it's three!!
Row: It's three how? When you count?--

(Randy walks up to the lab setup and begins to touch the vibrating support for the string. The string clatters to the ground.)

Ivory: It's four!! I'm not no retarded! I know its four, cuz I know how to count.
Keem: (*Speaking at the same time as Ivory in reference to the string that keeps detaching from the vibrator*) Now who's it?
Row: Randy
Keem: Exactly, I tole ya'll it waan't me. I did it one time.

(Randy walks next to Shakeem and bends down to put the weight hanger back on the end of the string. His back is toward Shakeem who is holding a meter stick.)

Keem: (*Hits Randy lightly on the back with the stick*) How you touch this?
Randy I ain't touch it.
Keem: (*Hits him again*) I said stop lyin'.
Randy I ain't lyin'.
Keem: (*Hits him again*) Why you lyin' more?
Randy I'm not lyin' more.

(Randy stands up and turns to Shakeem who tries to hit him on his arm lightly. Randy grabs the stick "Gimme that" and hits Shakeem on his back three times.)

Keem: Arright, chill, P. (*Randy gives the meter stick back to Shakeem.*)
Keem: Look. I'mana show ya'll one more time!

Ivory: *(Talking over Shakeem and I)* The ice is fixed, A [Akram]! I fixed one an' he fixed the other. *(She holds her watch up to the video camera)* The ice is kind of jiggly.

Row: You're counting, right? Are you counting the nodes or the antinodes?

Keem: These. These right there, I'm counting. *(Shakeem points to a node.)*

Row: That's a node. Ivory was-- Ivory was counting the antinodes.

Keem: *(Shakeem is bellowing over my voice.)* One! Two! Three! That one and this one, don't count. *(He points with meter stick to the two ends of the apparatus.)* If they did, it would be five!

Row: Ok, ok, ok, so you

May: *(Points again to the antinodes and counts)* One, two, three, four.

Row: If you want--

Keem: *(Shakeem glares at May and acts like he wants to hit her but he's holding himself back. He makes an angry sputtering sound.)*

Row: you can start with the middle, but what--

Keem: Alright do it again! Do it again.

Ivory: It's four!

Keem: It's four of these *(points to an antinode)* not these *(points to a node)*. I'm talking to both of you!

Row: Those are nodes, see? He's talking about the nodes, I was talking about the antinodes. Antinodes have the most amplitude.

Keem: *(Shakeem starts to talk over me to May and Ivory.)* Now, look at you. Look! Look at you!

Ivory: Guess what? It doesn't matter. *(Ivory looks at me as she says this.)*

Keem: *(To Ivory)* No, cuz she broke you when she said, "Well how many antinodes is out there?"

Shakeem's strategy of action in this situation became triggered by Ivory, May and my inability to acknowledge that he was "correct". That recognition was central to Shakeem's ability to continue learning, since it is not acceptable for Shakeem to be below any of his peers. He has strong feelings regarding the maintenance of an particular image of being on top of things and in front of others. Following the "egg drop" activity, Shakeem's explanation of his actions in that situation helped me to better interpret this incident. He noted that:

Yeah. That's exactly what it was. Yup. That's the whole thing. That's what it was – the competition. It was like a challenge and you got to beat 'em. You can't

be no loser in front of your peers. You the boy. You know it. So go ahead and beat them Shakeem. And I beat them. That's what it was. (7/24/01)

I think that I'm the best, man, and I'm like this: My ideas is the best can't nobody top me, so I think of new and different ways so that people can't top me. ...Cuz I'm thinking maybe somebody else will try to do the same thing I did yesterday so I made it better. (7/26/01)

During the most fervent moments of the group interaction, Ivory was able to tone down her involvement in the conflict. In addition, Ivory's confrontational attitude differed from Shakeem's with regard to intensity and threat, and instead, was characterized by both sarcasm and a nonchalant mentality. May's involvement in the exchange was limited and her strategies of interacting are discussed in the next section.

Non-Confrontational Strategy of Action

As a habit, May physically and socially distanced herself from the other members of DŪS. This attitude and style of interacting was evident as soon as May entered a learning environment, and it was vividly apparent the day that we went to the physics lab. From the very start, May positioned herself away from Ivory, Randy and Shakeem. In fact, she sat at a separate lab table and as soon as I gave the instructions, May began to work alone on Melde's string lab. Whenever May was situated near the others, simply her presence could instigate a string of teasing comments that were often meant to instigate confrontation. During the physics lab, there were only two when May sat at a table with the others. After almost an hour and a half of working on her own--with my periodic interaction, Ivory and Shakeem joined her at a table. May was chewing gum and as she did so, she was making popping sounds. For the first time throughout the entire lab time, conversation is directed to May:

Ivory: Come on May. Quit makin' all them snaps.
K: Come on, snap, crackle, and no pop. (lightly hits May's arm)
Ivory (Laughs loudly) Ahaha, an' no pop. That was kinda weak, but I had to laugh at it.
(Shakeem purposefully pulls the string off of the vibrator. The string falls to the ground)
Ivory: Come on May!
K: Oh, why you break it, May?!
(May doesn't respond.)

Although they varied, as to the level of maliciousness, depending on who was addressing her, such teasing remarks were commonly heard throughout the summer. However, May's common strategy of peer interaction kept her from engaging in confrontations, and, rather, May, "ole head"--as she was often called--would remain quiet or respond in what could be considered a non-challenging manner. For example, day after day, her peers would take turns telling her that she "got white hair." It's silver." May would answer quite calmly, "I dyed it for Halloween". Contradictions to this withdrawal strategy were evident when one of the male members would touch her physically in a manner that was unacceptable; then she would respond aggressively in a physical way.

May's non-confrontational strategies of interaction affected the types of teaching/learning experiences she and I shared. Whereas, I often felt intimidated by the other students' tone and sarcastic humor, it was very easy for me to communicate effectively with May during science discussions. On the lab day, we held several conversations that centered around the various physics labs. Below, I include an excerpt from a discussion that emerged from her experimentation with the string lab. That video segment was analyzed in terms of verbal exchange in real time--through a transcript, as

well as on a micro-level to observe our nonverbal behavior interaction with regard to gesture usage and facial expressions.

Narrative.

- Row: So what kind of waves are these? Remember when we were doin' it in the classroom? (*I gesture vertically with my hand, mimicking movement of shaking a rope up and down as we had done during a previous lesson.*) We were making waves on the rope?
- May: (*places her hand against her forehead*) I forgot.
- Row: Well they look like they're not moving cuz they sit there on the string.
- May: (*Places one finger on the vibrating string that is not currently vibrating at a natural frequency and therefore is not in a standing wave pattern*) But they are moving.
- Row: They are!
- May: Cuz they vibratin' an' you just can't see it.
- Row: So why do you think that it gets to the point that it looks like it's not moving. (*I move my hand to resemble a standing wave pattern.*)
- May: Cuz it's probably going so fast that you can barely see it.
- Row: Ok. Yeah, so it is going really fast, but sometimes when we were doing it real slow (low frequency), it would still do that. Right?
- May: Yeah so it probably got to be like in between the "both?" to see it. Cuz, no matter how --what you do to the amplitude, it's still gonna stay like that. But if you turn down the frequency, a little bit, it's gonna start shakin' a lot. (*May turns up the frequency, slightly.*) And you see it?
- Row: Yeah
- May: That look like four of them ? No that's only 3.
- Row: That looks like a lot. Can you turn up your amplitude so we can see them better?
- May: Let's try. One two three four five six seven. (*May gestures to the string that now has a standing wave pattern that has 7 antinodes. I follow her with my eyes as she counts. As she finishes, we both turn and share a genuine smile.*)
- Row: Wow, that's great. You got all the way up to seven. And what's your frequency?
- May: Let me see. Oh the frequency is 20, 20, 219.3.
- Row: So how many wavelengths is that?
- May: (*May gestures to the string and counts two antinodes. She places her flat open hand in a vertical direction after them to demonstrate an imaginary divider.*) That's two.
- Row: So two makes (one wavelength) (*May and I say this together in synchrony.*)

- May: *(She continues to utilize her hands as tools to help her count the number of wavelengths. After every two antinodes, she makes an imaginary divider with her hand. Once again, I follow her movements closely with my eyes and nod my head in agreement in response to her actions and verbalization.)* So that's one right there, that's two, that's three, and --
- Row: Three and a half. Good. *(May turns to me smiling and again we share eye contact and a smile.)* Three and a half. So what I was trying to talk to you about. Cuz what's happening is --
- May: *(May interjects)* It don't, it all happenin' from the frequency basically, because
- Row: Yeah! *(I nod enthusiastically.)*
- May: amplitude is just showing you, like when you said put the amplitude up just to see the wave. That's only lettin' you see the wave, it has nottin to do with the rest of it. *(As May talks about amplitude, she holds her thumb and index finger about two inches apart from one another to indicate height.)* But when you play with the frequency *(she turns an imaginary knob in the air)*, it's makin' it go like--it's makin' it do this *(gestures lengthwise across the string)*, like when we had it down real low, it had—we made this like one big wave *(hand motion mimics one antinode)*, then went to 2, 3, and now seven. So it's basically with frequency.
- Row: *(Again, May and I turn to face each other and when we make eye contact, both of us smile.)* That's real good, you understand it perfect. That's real good. And the thing --you're right everything is happening from the frequency. ...

Throughout this discussion, May and I had effective communication due to our equal attentiveness to each others verbal and nonverbal practices. During our conversations, making eye contact with May was a normal and naturally occurred effortlessly. This eye contact then provided opportunities for a sharing of sentiment, personal connections and the establishment of rapport and trust. In fact, micro-analyses reveal reciprocal attendance of each other's gestures such that we often used identical hand movements, at different points in the discussion, to talk about similar ideas. Her non-confrontational attitude towards interactions, although perhaps unhelpful in

interacting with her peers, provided great opportunity for learning when interacting with an individual, in this case myself, who also embodied a similar strategy of action.

Oral Tradition, Movement and Verve: Integrated Strategies of Action

Narrative. “RRRRRRRRRRRRRRRRRRRRRRR.” *Sitting at the lab table with the microphone/oscilloscope setup, Randy was imitating a car revving up and watching the monitor screen for the wave patterns being produced. He stopped and smiled. The lab day had just begun and he had already “claimed” this microphone. Although Ivory sat beside him, she showed little interest in Randy or the lab setup. “HUMMMMMMM,” Randy held the microphone to his mouth and hummed loudly. “Say something Ivory,” he requested. Without even looking up, Ivory silenced him, “Chill doggie ...chill,” she answered. Undaunted, Randy placed the microphone inside the tube of air part of the apparatus and moved it quickly back and forth. He observed the monitor keenly. Suddenly, Randy remembered Ivory’s headphones and CD player, and picked it up, “This got a radio on here Ivory?” Randy played a CD and placed the microphone on top of the headphone set. I glanced over; he was watching the wave pattern on the screen.*

About fifteen minutes later, as I worked with May on the string lab, lively rap music suddenly flooded the already noisy room. Ivory had decided to interact with Randy and the lab, and they had removed the earphones from the CD player to experiment. I was thrilled that Ivory put down her watch. She was standing up and starting to rap into the microphone, “kik, kik, kik, kik”. She began to move 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—she moved in perfect rhythm to the fast beat. Under the table, Randy’s feet began dancing through the air, but he chose to remain seated and complement the CD music with a high pitched sound “Erup, erup. Erup, erup.” While they continued to look at the monitor, Ivory’s focus seemed to shift to her dancing rather than the wave patterns on the oscilloscope.

Through my “teacher” lens, I remember being skeptical of the significance of this sudden burst of energy, music and dance in a classroom setting. Later, I even dismissed that section of the videotape as insignificant to the research study. Then one day, I looked closer and I saw “science” in Ivory and Randy’s dance. As Randy made piercing “erup” sounds, he moved his hands, palms down, one by one in an arched, forward movement through the air. Within seconds, facing the oscilloscope monitor, Ivory’s left arm began to move to the music in the shape of a wave – she arched it upwards 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. Between the two of them, learning physics had resulted in quite a performance.

Then I remembered. This interaction between Randy and Ivory resembled the day (7/12/01) that Jen came in with the slinky I had asked her for. The slinky was meant to be 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 and suddenly I found Randy holding onto the slinky and

Ivory holding Randy's hand. They had started to dance to a beat that seemed so perfect, but what was so profound was the way they moved their bodies so that it looked like a translational wave of energy was passing through them to the slinky and then reflected back through, in the opposite direction. Ivory started off with her head turned in the direction of her left arm, as she moved it in an arched manner, her head turned to Randy. Then, Ivory moved her right arm downwards while Randy's simultaneously arched up. Turning his head to face the wall, Randy moved his arm to "pass" the wave to the plastic slinky. As the wave reflected off the wall, the reverse order of movement then occurred. Through this coordinated movement of hands, arms, head and body, Randy and Ivory demonstrated the movement of energy through their bodies as representative of the movement of energy in the form of sound waves.

Movement and Verve. Boykin's (1986) psychological theories, emphasizing nine different dispositions of Black culture, are instrumental in describing both verbal and physical cultural resources held by the DŪS group and exemplified in the above narrative. According to Boykin, movement refers to "an emphasis on the interweaving of movement, rhythm, percussiveness, music, and dance, which are taken as central to psychological health" and verve is "a propensity for relatively high levels of stimulation, to action that is energetic and lively" (p. 61). As evident in the physics lab and as examples can be found throughout the summer, verve and movement dispositions permeated the learning environment and often aided in the students' learning process – although it could and did serve as a deterrent at times.

Whether Shakeem was moving up and down with the beat of the string vibrator he worked or Randy was tapping a meter stick at a lab table as he sang about frequency, the DŪS learning environment was rarely void of sound, action, music, and dance. While noise and movement in a classroom may traditionally be associated with misbehavior and off task activity, this study searches for instances when the students' high energy levels, fluid movement, and singing/rapping contributed to their learning process. Through their use of strategies of movement and verve, Randy and Ivory demonstrated usage of gestures that were integral to their construction of conceptual ideas related to sound. As suggested by researchers such as Crowder and Newman (1993), gesturing, such as that found in Randy and Ivory's wave dance, can communicate understandings of scientific concepts prior to and in the absence of language. Consequently, there is great value in directing micro level analyses to understanding gesticulation patterns that emerge as students interact with science tools in a learning environment (Roth, 2001). In this study, macro-level analyses of the research setting were insufficient in recognizing cultural capital of the students involved. In fact, it was only by focusing the analysis that the significance of verve and movement strategies in Randy and Ivory's learning process became more evident.

Oral tradition. From the very first day that I joined the DŪS group, it was obvious that rap was a common thread connecting all five students together. Whether rapping along with Eminem as they worked on their projects, freestyling out loud as they walked through the hallways, or writing lyrics for a rap for the DŪS project, there existed within the group, a definite love for this style of expression. Yet more than a popular

form of expression, rap was in fact a form of cultural capital that emerged as a resource for students to construct science understandings and often provided entryway into canonical science discourse. More specifically, according to Boykin (1986), oral tradition as a cultural disposition is “a preference for oral modes of communication in which both speaking and listening are treated as performances and in which oral virtuosity – the ability to use alliterative, metaphorically colorful, graphic forms of spoken language – is emphasized and cultivated” (p. 61).

During our unit on sound and as the sound movie was created, rap became strongly associated with the learning environment and a resource that was engaged by some of the youth. Shakeem and Ivory were most able to memorize, write and freestyle rap. Through interactions with both of them, I found that they valued styles of rap that suggested ingenuity or a unique charisma. Shakeem spent a great deal of time teaching me to recognize the descriptive, metaphoric merit of the lyrics of a rap. For example, “Cool, calm, just like my mom with a couple of valium inside her palm. It’s Mr. Mischief with a trick up his sleeve, roll up on you like Christopher Reeve.” Such an analogy of an individual who is able to create mischief as quietly as Christopher Reeve—a Quadra paralyzed man—was representative of Shakeem’s opinion of talented rapping. On several occasions, he asked me to listen to particular raps and compare his style and ability to that of the rapper. In a similar manner, Ivory also criticized rap video clips in terms of style. Sitting with her, she took me to <http://www.launch.com/> and showed me, for example, *Contagious* by the Isley Brothers, also featuring R. Kelly. She highly

regarded the rap lyrics that were almost sung, suggesting that this was a unique approach within the rap industry.

There's a lot of different artists out here that got their own style in rappin'. I think. I think it is a talent that everybody like go after. It's just, I think like it ain't about color or nothin' but I think that it's something that's in the world. That's in somebody –that's in everybody system. It is a big talent cuz I think it's like something that everybody dreams of being or dream of doin' someday. Everything that's out here is a talent—just like playin' basketball. Rappin', ya-mean, drawin' it's all a talent. That's like a hobby or somethin' that everybody would dream of becomin'. So it's gonna be a talent for a big – for a lifetimes. Yeah, I think rap is nothing but poems. Cuz like, you can write a poem, that's how I started rappin' an' I didn't even know how to write poems. It was raps and it was poems an' when it was poems, it was raps. Basically I say it's all the same. An' the poem don't really have to rhyme, it's just that the way you pronounce it—the way you say it. (8/16/01)

Poetry/raps authored by the DŪS squad. Ivory had written many raps since she was quite young—“I started rapping personally at the age of eleven and now I'm going on fifteen.” Yet, in all of her years of rapping, Ivory had never written or rapped in anything that was related to science.

*I'm gonna step up to the DŪS and spit what I heard
Harm to the ear from cities to suburbs
The rapists and jailbirds
Vibration and singing birds ...
You see my style is better than Hanks
and any character that step in his lank.
Discovering Urban Science is the DŪS do mad flow
we that squad not just filming on tapes
not just snapping pictures not just dissecting apes
That Bill Nye the science guy couldn't even
mess wit [with] dis [this] tape
You talk about me bein a young buck but I live a pro life
You mess with me you crazy you betta get ya fro right
cuz any problems with ya ears you betta get ya dough right
and that's that, that's a fact.*

Similar to Ivory, May too has been writing poetry since she was younger, and this summer she chose to utilize strategies of oral tradition for talking about science concepts.

In her July 27th journal, she included two poems.

*People depend on sound
to get us around almost everyday
we sometimes hate it but then
we love it especially when we play
Even the blind it helps them to find a
way to see in mind
sound makes vibrations which makes equations so
take advantage of this information*

*Imagine
Imagine a world with no speed and sound
Then we would definitely have no way
to get around, Everyone will walk around
with the same old frown. Imagine feeling
death holding your breath just dying to hear
a sound will it ever come around, will it
ever be found. But then imagine a world so
loud you can't bare to walk in a crowd imagine
it almost making you go death
Imagine it making you loose
your last breath. You take these
two worlds and put them together
Imagine your world being like this
forever do you think combining them
will make it any better just imagine.*

Although usage of canonical science discourse is minimal within both Ivory and May's writing, these forms of poetry represent promising steps upon a journey to acquire different ways of talk (canonical science discourse) through using their own ways of talk. Moreover, through oral traditions that were cultural resources in their toolkit for life, Ivory and May made connections between science and experiences that were familiar to their cultural backgrounds.

The role of rap in science lessons. On July 25th, Ivory, Shakeem and I engaged in an activity involving a wind-up car, water, and oil, as a catalyst for discussions about velocity, acceleration and frictional force.

Row: Let me write that word—velocity (*I write the word on the board*). That's just another way of saying speed. So speed is about how fast you're going the distance that you're going per time and then it's also about the direction that you're going. So Shakeem could you make it go (*He winds up the car very tightly*)— like don't make it go really fast. Make it go at a constant speed.

Ivory: Well it's kinda too late for that cuz he already winded it.

Row: Oh, well unwind it and do it.

Ivory: (*To Shakeem*) Start your engines. Mark get set -- you have five seconds to reach the finish line. One, two, you lose! (*Shakeem gives the car a push.*)

Row: Okay so he gave it a push. If there was no friction on this table at all— (*Shakeem winds up the car slightly and lets it travel across the table top.*)

Keem: That look like it --that look like it (*constant velocity*), though.

Row: That looked like it was moving on constant velocity.

Keem: Hold, look at this. Catch it. You ready? (*He winds up the car slightly and lets it go.*) Hold up. (*He winds up the car again and lets it loose. It travels across to the other side of the table.*)

Ivory: You Lose!!!

Row: At the very beginning, it accelerates though --cuz you have it wound up so at the very beginning its going to go a little faster.

Keem: Cuz it's a stick [shift], man. (*Winds it up again and lets it go.*)

Row: So why is it going to slow down eventually? (*As it comes to a stop, I ask*) What is it that keeps it from going on forever? ...

Ivory: The brake.

Row: Well, there's no brakes on it. I mean I'm not pressing any brakes so there's natural brakes on it. Ummm, it has to do with the tires.

Ivory: Rubber.

Row: Yeah rubber.

...

Row: Now if you put down water, how do you think it's going to affect it?

Ivory: Its going to be stiffer and slide cuz look at the -- (*Shakeem pours out a small puddle of water onto the table. He places the already-wound car inside the water. The car unwinds with hardly any forward movement.*) That was like cool. That's why when it rains its like hard to pump your brakes, and you can't get to the house.

... (*Shakeem pours down oil onto the tabletop, and smears it so that it fills the pathway of the car.*)

Ivory: Oh my lord, this is oil--it might work.
Keem: Yeah we bout to take it to the house.
Ivory: But its gonna make all types of U turns to get out the oil. If the water made it hardly go then that's gonna try to like turn and stuff.
Row: You--it'll be able to go easier?
Ivory: Naw it ain't going nowhere.
Keem: It ain't gonna make it this far. I bet you.

Once the oil was on the table, Shakeem poured water on top of the oil and began to spin the car. Both Shakeem and Ivory were clearly involved in the activity, yet it was difficult to maintain a discussion centered on the car's motion. Instead of struggling to engage them in talk about physics concepts, I decided to ask Ivory and Shakeem to create a freestyle rap on the activity they had just participated in with hopes that scientific discourse would emerge amongst the other lyrics. The first portion of the rap is presented below.

Keem: Watch this. Check it, Ivory. Watch this. Yo. We put the S-2000 on the table, greased 'im up an' see if he could beast 'em up. Uh. Ate all the cars up and it crashed because the friction in the table was not even there. You got gravity pulling 'im down. And you skate past the niggas cuz they thought they was clowns, uh. The grease on the tire, made them slippery, they slip an' they slide like the slip, the S&S crew. Oh no, you know I come through. I wish I was in the car, but then again I don't. You see it went off the table. There should have been a bridge in real life, even if real trite.

Ivory: Yo yo. This is how DŪS is --I'mana spit for you a little slowly --make sure you can hear me clearly. As I tell you about the project we did today, it was a little somethin' with the car -- a bad boy's play. Uh, what had happened was we went from the table to grease an' water an' see what the stable and then after, uh, we made sure it was hot and then after that it was cliff on the spot.

Although the amount of science talk appearing in this freestyle rap was small, Ivory and Shakeem's conceptual building process had begun, as later evidenced in the following

exchange between Ivory and me. The group was sitting in my office watching a neighborhood basketball game that she had recorded.

- Ivory: Did you see how she just fell? I mean she didn't have no (?) See that's science right there. Did you see how the girl just fell? (We rewind the segment.) Right here—her right there. See that!
- Row: What happened?
- Ivory: Cause the gravity. Pullin' her down. (Laughing) It did. Cuz I know I seen that.
- Row: Well--oh, what I want to ask you is ok, see when she's taking that shot right there and it went over. It didn't make it to the basket. Why why'd that happen?
- Ivory: Why that didn't make it to the basket?
- Row: Yeah. No, it went over the basket.
- Ivory: She put too much force on it. Oh!! Did you see that, Akram? Akram? Did you see that? That was AND 1 Akram! She watch too much. Watch this. Watch how she crack.
- Row: Let's talk about right there when she was doing that with the ball....
- Ivory: Action. ... The move, that's AND 1.
- Row: Ok. So she was giving the ball velocity. She was givin it ..
- Ivory: Speed
- Row: Speed. What do you think the difference between speed and velocity?
- Ivory: The what, huh?
- Row: Speed and velocity.
- Ivory: Velocity is when she was tryin' to make it go a certain speed, she was givin' it the works. She was givin' it speed to go there. ...That's where she fall. Did you see that? You hop back for that one! Did you see that?
- Row: Why'd she fall?
- Ivory: Because she ain't see where she was going, and she was busy lookin' at the ball, and when she looked, she just stopped, and she had too much speed and she fell.
- Row: What is it that makes someone be able to stop? If you look at their feet, whenever they're gonna stop, what do they do?
- Ivory: They slow down. They push down on gravity.
- Row: So, if someone's got like on a pair of their shoes like that (sneakers) and someone else has a pair that's real slippery on the bottom or they had heels or something? Could you play basketball like that?
- Ivory: Huh? If it was like what?
- Row: No I was saying like you're wearing the wrong shoes.
- Ivory: Yeah.
- Row: What makes the difference?
- Ivory: Well, there's a lot of people that do that. They play in sandals and stuff.

Row: Do they play just as good?
Ivory: Naw.
Row: What do you think makes the difference in the shoes? Why you think why you think shoes is such a big deal on the courts?
Ivory: Baby, cuz I'm a thug. I down't know.
Row: What about. Ok, remember the day we did the cars and we found it was slipping and sliding everywhere. So think about that with regards to shoes that you wear when you play basketball. What kind of shoes do you want to have?
Ivory: Something with grip on it. Rubber.

The freestyle rap created by Ivory and Shakeem and follow-up conversations like the one above demonstrate a promising beginning to their conceptual understandings of Newton's laws. Moreover, such experiences encouraged me to embrace rap as a cultural strategy that could aid the science learning process. For example, as we continued to learn about Newton's laws, I decided to write a rap to help emphasize the difference between speed and velocity. My plan was to write some of the lyrics and then elicit Ivory's help with writing the rest. My plan did not unfold as envisioned, and instead I found myself rapping to May, Ivory, Shakeem, Randy and Tim.

Speed, it means something different on the street
In here we move to a much different beat
Traveling a distance in a period of time
Hey sit back and relax, I ain't givin' you a dime
Speed
Speed it's the same thing as velocity
Except you add direction, hey that ain't an atrocity
Direction: north, south, east or west
Hey DŪS on the set, we ain't nothing but the best
Direction, up down, left or right
I told you sit back and relax, you be lookin' all uptight. (7/26/01)

The reactions ranged from "I'm sorry, but that sucked!" (Tim) to "That was decent!" (Ivory). Almost immediately, this experience seemed to help me build relationship with

the group; yet the implications for learning remained unclear until later, when Shakeem and I engaged in a conversation about velocity in reference to a computer basketball game.

Row: Now what's the difference between speed and velocity?
Keem: There's no difference it's the same thing,
Row: It's the same thing.
Keem: 'Cept that velocity is in a diff—wait speed is veloci—Damn! Wait.
Velocity is speed in a certain direction.
Row: Good! How did you know that?
Keem: Cuz I heard you this morning.
Row: (In disbelief) You did hear me say that?
Keem: Yeah.
Row: Did you hear me say that in the rap?
Keem: Nods

Conclusion

Teachers need to know more than what is conventionally included in the school curriculum—facts, theories, and procedures fundamental to their subject matter; teachers need to have thorough understanding of science, including its content, history, culture and discursive practices, as well as an understanding of student populations and educational processes, so they can provide opportunities for personally relevant engagement in science by a wide variety of students. (Barton, 1998, p. 12)

When I had my prospectus dissertation defense, I entertained many questions regarding my proposed study, and one of the most interesting questions I heard was: “What would a curriculum that valued students’ cultural capital look like?” Her question echoed my own thoughts as I worked with DŪS. I wondered how I would teach the physics of sound and the concepts relating to force, friction and energy in a manner that

each student's cultural toolkit would be realized, utilized, and ultimately enhanced. How could I teach in a manner that would be socially liberating rather than oppressive?

While traditional emphasis for science teachers has been placed upon building content understandings, this study supports researchers like Barton who attribute parallel importance to teachers' understanding how to present content in ways that the students' cultural resources are realized in the learning process. When I left the physics lab on July 17th, I realized I was missing a very important part of the picture that could only become more focused through developing understandings of cultural influences from across fields in the youths' lives. How could I teach a curriculum that could draw upon their capital when I was having difficulty understanding the strategies that were appearing in the DŪS setting that was actually culture being enacted from other fields? One can't learn to climb a mountain by looking at pictures or standing at the bottom and looking upwards to the summit. I needed to acquire deeper understandings of the cultural backgrounds of the DŪS group and what types of strategies were important in their lives and, more importantly why. Thus, while this chapter forefronts situations occurring within the learning environment that indicate weak cultural boundaries or cultural enactment of resources from different fields or lifeworlds, chapter five provides images of cultural attitudes, styles, rituals and habits that emerge from the homes and neighborhoods of the DŪS youth.

CHAPTER V
UNDERSTANDINGS FROM HOME AND NEIGHBORHOOD
CULTURES

Ties to Home

The Weak Boundaries of Culture

*Keem: Crack just like me. We both bad mothafu**as.*

Row: You're bad?

*Keem: When I wanna be. That's why I don't do too much talking cuz I might gonna say something ignorant and fu** someone up.*

Row: You don't say ignorant things. What do you mean?

Keem: Yeah cuz I pace myself, man.

Row: You pay attention?

*Keem: Yeah man. I could snap on a lot of niggas¹³ for some dumb stuff. I'll be like, "Naw, ain't gonna say nothin'; I'm cool; I'mana chill" I got a bad ass temper, ya-mean.... That's why niggas would be like, "Damn, how to fu** with Shakeem?" Exactly. You can't fu** with me cuz I'm the shit. That's why I don't never be thinking about, I don't have no time to think about, "Oh, I wanna learn this. I wanna learn that." Cuz I be on some ol [whole] other shit, that's why.*

Row: What's the stuff that's more important to you?

Keem: It's not even the fact that it's more important, I just be on some ol other shit, that's all. It's like I learn it when I get there.

Envision the womb of a mother in which a tiny embryo grows. Although separate entities, mother and child are interconnected through a single cord. There,

¹³ A person of any race could be referred to as nigga, but only by an African American.

within a pocket of warm darkness, a joined relationship exists to such an extent that every liquid, nutrient or chemical substance entering the mother's system affects the child's body. A being nested within another, such a sharing of lives that the boundaries separating baby from mother are as illusively transparent as the amniotic fluid surrounding the fetus. This image is comparable to individuals within society, in that we exist as part of numerous cultures simultaneously; we live and interact in subcultures nested within subcultures whose weak boundaries are evasive, blurred, and indistinct.

When I'm in the house, I curse. An' I curse, and when I'm outside I curse more. ... Oh, I curse in school, just not around the teachers. ... And like when I'm outside, it's like all hell. It's curse everything, curse, curse, curse. When I'm in my house, not everything, but a lot, curse, curse, curse. (Tim, 10/16/01)

It has been asserted by researchers, such as Seiler (2001b), that there are overlapping lifeworlds or fields to consider when looking at individual students in a classroom environment. She expresses, "There exists a need to look both within and outside of schools to understand reproduction and to recognize that cultural, economic, and political influences from other spheres impact what occurs in the classroom." In accepting such a model, understanding the home and neighborhood cultures in which African American inner city youth, such as May, Ivory, Shakeem, Randy, and Tim have been raised is crucial to building an understanding of their cultural actions within the summer context of learning. In fact, some researchers believe that it is only through becoming familiar with the different lifeworlds in which children live, that science can become more accessible to all students (Aikenhead, 1996). This dissertation provides

evidence that teaching scientific concepts to urban African American students in ways that invites agency necessitates an understanding of the diverse cultural resources they embody.

Tool kits containing resources from various fields.

Teachers want to do something with us –want to teach us more. Like, we just don't want to learn. And that's another issue.... Cuz, arright, it's their environment they around. If they got their friends that don't want to do nothin', they ain't gonna do nothin'... If they just lazy, or got problems at home, they just not gonna do nothin' in school. (Ivory, 7/5/01)

Working from the notion that culture provides individuals with a “tool kit” (Swidler, 1986) from which to construct different strategies of action, it is easy to recognize that when children enter a science classroom, they tend to engage cultural resources they already have knowledge of and are familiar with. It is from their tool kits that student beliefs, attitudes, styles, rituals—strategies of action—regarding learning emerge. Seiler (2001b) elaborates:

Social interactions are influenced by aspects of the larger social world, that is, by assumptions, expectations, dispositions, and language patterns from our life experiences. These comprise an actor's habitus, schemas, or cultural toolkit. They provide a sense of the game, of how to act and respond.

With a tool kit that is essentially habitus, teachers have to address the strong authority of habit, normality and common sense that informs students' actions. Without understanding the different cultural environments to which the student belongs, the cultural tool kits that are available and the associated structures that limit the cultures, teachers are poorly equipped with the skills for helping their students learn science in a manner that will encourage social transformation. Phelan et al. (1991) elaborate:

On any given school day, adolescents in this society move from one social context to another. Yet students' competence in moving between settings has tremendous implications for the quality of their lives and their chances of using the education system as a stepping stone to further education, productive work experiences, and a meaningful adult life. (p. 224)

In the DŪS learning environment. Moving from Florida to West Philadelphia could be described as a life-altering event for me. Growing up in a small Texas city all of my childhood and then living in a small Florida city for much of my teenage years and beyond, I wasn't familiar with the inner city lifestyle found in a large city like Philadelphia. Consequently, I lacked insight into why the DŪS youth acted and interacted in particular ways within the summer learning environment.

This study weaves together social and cultural descriptive threads to provide vivid images of symbols and systems of practice indicative of the home and street cultures of inner city teenagers in Philadelphia, through a combination of the following three sources:

1. raw video footage from the streets of Shakeem and Randy's neighborhoods, including interviews with neighborhood friends;
2. audio taped, informal and formal conversations that occurred throughout the summer at the University of Pennsylvania setting; and
3. travels through the streets of Philadelphia with Shakeem and Ivory as tour guides.

Analyses of such data sources reveal patterns of thin coherence and weak cultural boundaries as cultural resources, rooted within the home and/or street, manifested within the school-like DŪS context. May, Ivory, Shakeem, Randy, and Tim's willingness to share personal elements of their home and neighborhood lives is certainly commendable

and has provided me with insights, otherwise inaccessible, into understanding how they participated as learners in this study. More specifically, this chapter paints a rich tapestry of coherence and contradiction of the strategies of action that characterize the subcultures of home and neighborhood for inner city, African American, poverty stricken youth.

Cultural Capital from the Home and Neighborhood Fields Enacted in the Learning Environment

Decent and Street Social Categories

According to Anderson's (1999) sociological work, inner city African American families readily distinguish between two different social types or cultural groupings of individuals: decent and street. In the learning environment of DŪS, May, Ivory, Shakeem, Randy, and Tim each engaged strategies of action that were consistent with both the decent and street typographies, yet to varying degrees. The extent at which the youth presented street or decent characteristics depended greatly upon the dynamics of life inside their home and their level of interaction with the street/neighborhood setting. This social typography system helps to make sense of the strategies of action that May, Ivory, Shakeem, and Randy engaged in the physics lab context. Whereas confrontational and non-confrontational attitudes can be understood in terms of "street" cultural lens, the attitude of determination engaged by Ivory, for instance, is rooted in the decent typography. It is important to emphasize that a repertoire of tools that include *both* decent and street strategies is desirable for African American urban youth and may even

be necessary to their survival. Consequently, the cultural resources exhibited by the DŪS youth in this study— whether street or decent – can not and should not be ranked in merit. Rather, different strategies of action differ in value within varying fields.

On the Inner City Streets of Philadelphia, Pennsylvania

Perhaps the most common images of inner city life are those that are bitter, depressing and violent. While it is important to recognize that street violence, ranging from *catching a body*¹⁴ to *mystery night*¹⁵ eggings, burglaries, shootings and drug-related disputes can be described as events that occur in the lives of African American youth, such as those in this study, there also exist innumerable activities within their neighborhoods that are in stark contrast to such violence. Moreover, it is precisely the mix of street and decent elements of culture, of fear and laughter, of the illegal and the legal, of despair and hope for the future, and of brutal killing and commendable rebuilding that complicates the process of understanding the strategies of action within the DŪS group.

The Presence of Guns

Shootouts near May’s house. *The other day, it’s all these cops that comin’ on the corner of my block. And like all these um, cause this dude he had shot at a cop. Um, did you watch the news on Saturday or Friday? One of them two days. They said, cause it was on the corner of Cecil B--25th and Cecil B, right.... It was like this tow truck lookin’ thing right.... All these people started movin’ out the way, and it looked like the whole*

¹⁴ Ritual in which a group beats up an individual. This is discussed in greater detail in the sections below.

¹⁵ Mystery night is October 30th, and in certain areas, such as “DaBridge” near the Philadelphia Zoo, passing individuals become a target for raw eggs.

police joint was down there; lookin' all over for this dude. An' um they said they're gonna get the SWAT team. They probably gonna put it on the news, but when I had turned to the news, it was about to go off anyway cause we was all outside, then my mom came up here, an' she called us in, an' um she locked the doors and stuff. Cause she um—like this big truck came in there. She was like, "Oh my God, here they come!" Cause she thought it was like um the SWAT team, but it was really just a big truck. (May, 7/23/01)

Murder

Next door to Tim. *It was like somewhere in March or like, February or March, this guy, he got—this guy he got killed just two doors down from me. He got killed in the house. It was immediate and we heard a big crash, and it was like. Didn't nobody—cause normally, it's like a whole bunch of people in that house, but just that, it just so happened that when he got killed weren't nobody in the house besides him. And the boy he ran across the roof, all you heard "tap, tap, tap". (Half past) the roof, he jumped down on the car. Then the cops was all like flashin' lights all over our house. (Tim, 7/23/01)*

In May's Neighborhood. *When I was little right, I used to live in um Southwest like an' um it was on Ridgeway Street and one day we was outside playin', and my sister she was skating, right. So we seen these dudes run down the street with a gun, an' um this other dude is in front of 'em, right. It's three of 'em chasing 'em, and we all ran in the house, and the dude, they had um they had um they had shot him. Then they walked away and started laughin', right. An' my dad and my mom was real scared cause they*

couldn't find my little sister nowhere. An' she was outside, she was right by them while he was shootin' him. An' they looked my little sister dead in the eye, and they just started laughin'. An', she [May's mother] ran over there and she pulled her in the house an' stuff. Then all these cops came an' stuff. He just bumped the man there. Then, like um by that same lot, right, then um this lady named Ms. Valerie, she used to live right in their house, right. An um, her boyfriend came outside with gun, and he was holdin' it to her head, and made her get inside the car and whatever. Then he took her somewhere.

(May, 7/23/01)

In Randy's neighborhood. When Randy brought the video camera to his neighborhood, he captured an interview between two boys from his area. Although the boy (B) answers the questions posed by the interviewer (I), he does so with great caution. In this video segment, his body language and eye contact both indicate his discomfort. Moreover, as their exchange continues, the boy begins to look increasingly nervous and finally ends the conversation rather abruptly.

Int: What kinds of memories do you have here?
Boy: Everything that happened, I remember. Like a lot of stuff
Int: Like what? Can you tell me something?
Boy: People died around here -- got shot, robbed
Int: People like who? Anybody you know?
Boy: Yeah
Int: Who?
Boy: My ole head¹⁶
Int: Oh. .. They got shot?
Boy: Yeah.
Int: And robbed?
Boy: Yeah
Int: Did they die or they made it through?

¹⁶ Ole head refers to a neighborhood mentor.

Boy: Died
Int: I'm sorry to hear that. So you know do you think there's a lot of violence around here?
Boy: Not really. Not like it used to be
Int: Not like it used to be. Is there a lot of things going on around here-- things that shouldn't be happening?
Boy: No, not really. That all?

Systems of Practices and Symbols

In large urban cities like Philadelphia, murder and homicide are not occasional happenstances. In comparison with its nearby suburbs, inner city Philly has a murder rate that is seven times higher (Utt, 2000). In fact, according to the Heritage Center for Data Analysis (2000), young African American teenage males tend to be the group overrepresented in these distressing statistics. In Philadelphia, the probability of a fifteen year old African American male being murdered before reaching the age of 45 is 4.5%, or about one out of twenty five are murdered. Utt (2000) writes,

The average probability of being murdered in 1998 before reaching age 45 for a young black male ranged from 8.47 percent in Washington, D.C., to 1.89 percent in Brooklyn. By comparison, the death rate for U.S. soldiers serving in the military during World War II was 2.5 percent; during World War I, it was 2.4 percent; and during the Vietnam War, 1.2 percent of those who served in the military were killed. Strictly speaking, these military death rates are not comparable to the rate for young black males in urban communities because they were endured over much shorter periods of time; but they do illustrate the magnitude of the risk faced by African-American males in these eight communities today. (<http://www.heritage.org/issues/chap13.html>)

The vignettes of violence presented in the above section provide genuine emotion and live faces to the numbers found in technical reports, newspapers, and magazines throughout the nation. Inasmuch that Sewell defines culture as a dialectical relationship between systems of practices and symbols, the commonplace occurrence of murder

inclines one to view it as a cultural activity indicative of the life on inner city streets. As with all cultural practices, the symbols that serve to reinforce them must also be considered. Without a doubt, guns represent the most popular symbol that is engaged to accomplish the practice of killing. In fact, the proliferation of guns in the hands of youth in inner-city communities has become a trademark of the inner-city hoods and a symbol of the street culture. Many of the rap artists express the prevalence of murder and guns in their music. DMX's *Ain't no Sunshine*© affords a lucid example.

It ain't no sunshine when
The Dark Man comes out
And I want mine, so I plan
To keep my gun out
We got four 9's, so niggaz
Run in and run out
But I bust mine, 'cause I'd like
To hear some shouts...

But you be blind, I'll do it 360
And come up from behind
Tap you on your shoulder
Have you turnin' around
Hit you with somethin' that'll
Have you burnin' the ground

Contradiction: The Flowers among the Graves

This is our garden. An' it got people's names on it. See the nice flowers and stuff—tomatoes. Too bad you don't see the tomatoes, but the little kids be throwin' them. But look at the nice paintins on the wall. This is good. This is something good in our neighborhood. See the paintins on the wall, flowers, all that stuff. ... They got somethin' you can sit around in. Hey got a little shack, right here. Over here, we're about to go in a few minutes, we're about to go over by playground for little kids. I'm just showin' you this because this is something good in our neighborhood that we need. (Randy, 8/28/01)

The very first site that Randy recorded in developing his video ethnography was the neighborhood garden. This little haven amidst the crossfire held special meaning for

Randy. While we watched the tape, he proudly pointed out the mural that he had helped to paint when he was young. In Shakeem's neighborhood, we watched video footage of a young boy named Steve hard at work with a small shovel in a community garden "tryin' to make the world a better place"—in Shakeem's words. In addition to gardening projects that provide different avenues for youth to achieve feelings of respect and self confidence, organizations such as Habitat for Humanity play important roles in providing a safer environment for children.

Randy: I seen the Habitat down the street. What is they doin'?

Cousin: They buildin' playgrounds for the little kids.

Randy: An' they buildin' houses and stuff?

Cousin: They remodeling like abandoned houses on side streets. (8/28/01)

Abandoned houses also represent common symbols of poverty stricken neighborhoods. They serve as attractive sites for drug dealers and drug users and consequently, they become stages for violence to occur. In neighborhoods such as Ivory's, abandoned houses are dispersed throughout every section of row houses, often allowing drug trade to occur right next door to family homes. Thus, when governmental agencies or private organizations take actions to decrease the number of abandoned homes, they are applauded by many. In a similar manner, the building of playground facilities to provide locations to remove children off the street are considered positive attributes for the inner city environment. In Randy's video, he shows how the playground provides the younger boys in the community with a place to congregate and play innocent games such as "flipping" through the air. In Shakeem's neighborhood, there is a basketball court and field area where the kids organize teams themselves and pass the hours away in competitive sports like basketball and football. In a videotaped basketball game that

Ivory shared with the DŪS group, youth are seen gathered around an outdoors basketball court to watch neighborhood girls' teams compete. An amateur D.J. announcer follows the game and adds excitement to the air for the small crowd that assembles. In collecting video clips from their neighborhood streets, Ivory, Randy and Shakeem have captured footage depicting, what they would consider to be, positive images in their neighborhoods. As a result, their ethnographic work provides excellent examples of contradictions to prevalent violence in their hood.

Drugs

Keem: I wanna learn why crack kills. Cause, I swear, so many niggas is on that shit, its ridiculous man. So many ?? down my way, they they smoke.... That fu**ups is poison. That's all it is, it's poison. And niggas are just like, "Oh shit, I gotta get it, I gotta get it, I gotta get it." I'm like, "Damn, you skinny as hell as it is, man, you doin that rock, that shit ain't makin' you no feel better". People say, "Al right, it's good to be skinny. It's good to be a certain size." But dang, you're not supposed to see your ribs and your insides and stuff. That's ridiculous man.

Row: So do you know any people on crack died from crack?

Keem: That's the shit I'm tellin' right here. I know plenty of people that died on that, they call it the rock.

The drug problem on inner city streets has reached epidemic proportions, and the students in this study are directly affected, often in the most personal ways. In fact, the widespread presence of drug dealers and drug houses on inner city streets results in youth's common knowledge of what goes on.

Row: What would you say is the most common drug that um gets used around here?

May: Weed.

Row: Weed.

Randy Weed.

May: And crack.

Driving through the neighborhoods in West Philly with Shakeem and Ivory, there were constant references to crack cocaine. Very inexpensive in comparison to the powder form, crack cocaine has become a trademark of poverty stricken areas. There is rarely an area that is not affected by this underground industry. The dealers can be seen standing on their corners and the crack houses can be found interspersed throughout the neighborhood. As we drove by a daycare center, Ivory pointed out the crack house beside it. As we passed her house I saw the crack house, just three doors away.

See the the drug house near um—next door like two, three doors from me, they um they quiet, so it's like you hardly know they there. Only time you'll see them is probably them comin' back and forth out the house at night—late at night. But I don't be outside late at night, so you don't hardly see them. They quiet. [long pause] They're about to tear um our building do—the building down—the crack house down. That's why they moved out there. ...Cops done came like ten times this summer and they still don't find nothin'. So then somebody tried to fire bomb the house one night... And instead of them throwin' it --they tried to throw it through the crack house window and instead of them throwin' through the window, it bounced of the window and went the other--to the other house and burnt the carpet on the porch and it was about to burn our house. And we had to call the fire department. We still don't know who did that. (Ivory, 8/14/01)

This entanglement of the drug trade and neighborhood life is not unique to Shakeem and Ivory's areas, in Randy's neighborhood, one boy spoke about a space known as Baby Square--across from a local elementary school. He described it as "*infested*, I mean *infested* with drugs," yet in the same breath, he talked about the young children who play in the area, sliding down the slides and swinging on the jungle bars. Not every neighborhood has the same level of drug visibility and the same epidemic levels. For example, in May's new neighborhood she found the number of drug dealers to be less than her previous home in South Philly. In Ivory's neighborhood, the dealers are older and have more experience. As a result, the underground business is quieter than

areas where the drug commerce is controlled by the youth. She explained further: “Older guys they like, they know how to maintain themselves. They know how to like--they been in their game longer so they know what they doin’, and younger guys, they just do whatever they see. Like they would risk to get money (8/14/01)”.

In the poverty stricken neighborhoods that must deal with the manifestation of racism and lack of employment opportunities, there are mixed feelings regarding drug dealers. As expressed by (Anderson, 1999), “In the inner city community, drug dealing thus becomes recognized as work, though it is an occupation that overwhelming numbers of residents surely despise” (p. 121). Without a doubt, drug dealers hold the most power on the streets of inner city neighborhoods in that the drug culture significantly informs the street culture. As with many of the practices indicative of inner city neighborhoods, respect and power dynamics remain compelling attributes to gain and maintain.

The drug dealers around my way. They don’t have--I think they have the common knowledge to go outside and get jobs, I think they’re afraid because nobody’s gonna know their name. If I’m a drug dealer and my name is Big Neith, everybody in that neighborhood is gonna know I’m Big Neith, and I sell drugs, and pretty much I got a gun. If you go somewhere in Center City and you try to go and get a job doing some office work, and you don’t get something you like. You can’t say you’re Big Neith cause nobody knows you... You’re just like everybody else. (Shakeem, seminar presentation, 9/01)

Simultaneous Rejection and Acceptance of the Drug Culture

The blending of the drug industry into May, Ivory, Shakeem, Randy and Tim’s everyday life allows many contradictions to emerge. During an interview with Tim, he explains this merging of lifestyles.

It’s that arright you got 5 different type of people in your neighborhood. You got the drug dealers, that’s one. You got the drug users, that’s two. You got the

older—you got um seniors, three—which is the older people. You got kids, four, an' you got me, five. They all interact, cuz they grew up with each other. It's that they have no choice but to accept what's going on. So, like if like a drug dealer got a problem with a drug user, it's probably that the drug user probably gave him, didn't give him enough money for the drug. An' it's gonna be probably gonna be some kind of fight right there. But as soon as the fight is over, they go back to being cool, an' everyday all interact one another.

These type of neighborhood dynamics makes it easy to understand how, even though Ivory comes from a decent home which has taught her the harmful effects of drugs, she can speak to a “crack head” for some basketball advice. During our trip through her neighborhood, the following conversation took place.

Ivory: (Yelling out the car window to an older man standing on the sidewalk)

You gonna teach me some more basketball tricks?! I gotchya.

Gale: Who's that?

Ivory: I don't know.

Keem: That's the ole head of the block. Everybody's got one. Ha ha ha.

Ivory: Ha ha. Yeah. Gonna teach some tricks. He doesn't live on my block though. He be on it most of the time in the crack house, I think. He do know how to play ball though. He know how to do like tricks with the ball, like hold the ball and stuff.

Another example of the social mixing between drug dealers and the youth coming from homes that promote contrary values is also evident in the following exchange between May, Randy, and me.

Row: I was just wondering in Philadelphia is it-- do you think like there's like a big problem with like shootings and drugs and stuff like that in most of the neighborhoods, or is it pretty manageable?

May: It's a big problem.

Randy: Umumm.[no]

May: Yes it is.

Randy: Never. I know everybody so its cool.

Row: No but if you didn't know somebody. If you didn't know anybody.

Randy: Would you ask me that question again?

May: She said is it a big problem with drugs and guns or it a manageable problem?

Randy: It's cool. It's cool.

May: I think it's a big problem.

Randy: No. ... That's my homies, dog.

May: Yeah but people that do drugs it's a big problem for them.

Randy: That's my homies so no it's not.

May: (getting exasperated) Just cause you their homies don't mean it's not no big problem.

Socialization in inner city neighborhoods does not stop at the brinks of the drug industry. In stark contrast, both male and female teens tend to know who the drug dealers are as well as the users.

The Deeper Meaning: Respect

According to Sewell (1992), the role of cultural symbols is not simply to support cultural practices. Rather, it is through studying the semiotic relationship between systems of symbols and practices that the deeper meanings surface. Thus, it is through understanding the deeper meaning beneath inner-city street occurrences, whether violence, drug traffic, recreational activities or rejuvenation projects, one begins to acquire a feel for the habitus or cultural tool kit that comes to school with inner city kids.

Cultural practices such as those described in the above sections and the symbols that reinforce them are representative of what Anderson (1999) has coined, the code of the street. Briefly stated, on the street, image is everything. Moreover, it is the search for and maintenance of respect that drives the majority of practices or serves as the motivating outcome (Cole & Engeström, 1993). One must have an acute understanding of the consequences of others' perceptions of him/her and be willing to, not only, present a tough front, but also, be willing to defend such a stance. "Given its value and its practical implications, respect is fought for and held and challenged as much as honor

was in the age of chivalry” (Anderson, 1999, p. 67). Much of the code has to do with achieving and holding possession of a gun and symbolizes the ability to forcefully demand respect from others and to emphasize the point of who is number one. In fact, sometimes, simply threatening use of a gun, “I’m gonna shoot you!” may invoke enough respect, initially, although eventually the words may be “empty” until backed up through action. However, certainly, whether in the form of an actual weapon such as a gun or simply in a heated exchange of words, successfully navigating respect on the streets requires the embodiment of confrontational strategies of action.

Confrontational strategies of action in the DŪS learning environment. *I’ll never forget the day that Shakeem pulled a fake yet extremely realistic gun out of his backpack, came up behind Ivory, and placed her into a headlock with the muzzle pressed up against her temple. As my heart nearly leaped out of my chest, I looked into her eyes and saw genuine terror for a split second just before Shakeem released her laughing. This act of “play” revealed much to me --as did other games Shakeem would engage me in -- such as entering my office so quietly that he was able to come up behind me unnoticed and say, in a low voice, “This is a stick up”. He would often be disappointed with my performance, lamenting that if I had really been involved in a stickup, I would have “been had”.*

Not all of culture is habitus or subconscious; there is a part to culture that is conscious and often practiced until it becomes a deeply integrated practice in your life. On the street, in poverty stricken neighborhoods, knowledge of how to perform a stick up effectively can be useful for the perpetrator, yet as Anderson (1999) points out in his

work, it is often the victim who requires knowledge of “how to get robbed” (p. 125)! More specifically, certain patterns of interaction should occur so as to defuse the situation with the least amount of danger to the victim. For example, recognition of defeat should be expressed by the victim to allow the perpetrator to leave while maintaining power and integrity. “Life under the code might be considered a kind of game played by rules (p. 99);” thus, it is to be expected that young people, like Shakeem, engage confrontational strategies of action to become proficient with the street system.

Due to a lack of confrontational strategies of action within my cultural toolkit, Shakeem was not very successful in his attempts to get me to “play” such far-removed games from my experiences. I was easy to catch off guard, didn’t know how to respond verbally and had no conception of why Shakeem would even want to interact with me or the other DŪS members in such a seemingly violent manner. It was as if we were listening to two contrasting beats. Not only were he and I out of synch in terms of the cultural resources that we commonly utilized across our lifeworlds, we sought different outcomes in the learning environment.

The meter stick dance. Similar to the exchanges that occurred between Shakeem and I in the above vignette, the “meter stick” interaction that transpired between Shakeem and Randy¹⁷ provides an additional example of ritualistic, confrontational street strategies that appeared within the DŪS learning environment. In a situation where the object of student interactions should have been to learn physical science, the strategies of action that are actually engaged during the interaction are very similar to those that would

¹⁷ This interaction is briefly noted within the node/antinode transcript in the previous chapter.

be employed in their neighborhoods to help achieve the desired outcome of respect. Hence, in contrast to my interchanges with Shakeem, what transpired with Randy was harmonious, like a dance well rehearsed. Both boys played their part/role with utmost ease—keeping the interaction moderately intense so that neither one was in danger of being degraded or felt seriously threatened. As I viewed this 25-second video segment frame by frame, it was amazing to witness how “street ways” had made their way across vastly different cultural fields into my science lesson; and even more powerful was Randy and Shakeem’s uncanny mutual understanding of how to perform.

The game began when Randy bent at the waist to pick up the fallen weight hanger so as to attach it to the end of the string. His back was toward Shakeem who sat behind him on a stool, holding the long wooden stick.

Keem: *(Hits Randy lightly on the back with the stick)* How you touch this?

Randy: I ain’t touch it.

Keem: *(Hits him again)* I said stop lyin’.

Randy: I ain’t lyin’.

Keem: *(Hits him again)* Why you lyin’ more?

Randy: I’m not lyin’ more.

As Shakeem and Randy interacted, the sentence exchange between them was short, yet more remarkable than the verbal exchange was the physical gesture—a quick hit/tap on the back—that accompanied every comment that Shakeem made. When Randy had finished hanging the weight he stood, looking downwards, and turned towards Shakeem. Viewed frame by frame, what occurred next indicated Randy’s anticipation for Shakeem’s next blow. Before Shakeem moved the stick again, Randy already started to bring his own hand upward. Thus, as Shakeem tried to bring down the meter stick on his

arm, Randy was ready and easily intercepted the last blow. For half of a second, both of the boys were face to face as they each held the meter stick with one hand. Then it was almost as if Shakeem loosened his grip and allowed Randy to take away the stick. As Randy moved to stand behind him, Shakeem looked over his shoulder in expectation of the hits Randy proceeded to administer (not maliciously) to Shakeem's upper back. In slow motion, Shakeem's reaction was comically perfect in that as the wood made contact with him, he arched his back and made facial expressions equipped with wide-mouthed movements indicating feelings of pain. Randy wore a small grin as he hit him, yet after three times, Randy paused with the stick held high in the air. He was waiting, and sure enough, within milliseconds, Shakeem gave him a verbal symbol to end the game, "Arright. Chill, P". Almost instantaneously Randy stopped. Shakeem didn't even turn around, nor did they exchange words, rather Randy maneuvered the meter stick around to almost touch Shakeem's right hand, and held it there until Shakeem took it back.

Most significant in this dance of honor is its ritualistic, playful nature as depicted through the momentary pauses, exaggerated facial expressions, and most importantly, the boys' lighthearted tapping rather than malicious beating with the stick. In fact, more than anything, this interaction signifies weak cultural boundaries given that the campaign for and maintenance of respect does not remain outside on the streets. For individuals such as Shakeem whose financial situation doesn't allow him to always buy material items possessing symbolic capital, he has to rely upon his confrontational strategies of action reinforced through ritual play in instances when his respect among peers is at risk.

Anderson discusses the importance of material status symbols, "A particular brand of

eyeglasses or shoes or pants can indicate a person's social standing, bestowing on him a certain amount of self esteem (p. 112)"

Keem: Cuz I don't got a whole lot of them *Guess* like the rest of 'em. I don't got them expensive jeans, I don't got the latest sneakers stuff like that. I don't know but my hair ain't always cut just as quick as everybody's else's so—

Sarah¹⁸: Do you think it's bad that the kids categorize? Does it hurt?

Keem: I deal with it cuz I been havin' it since I was little. Ain't nothin' new. I ignore it.

Sarah: Has that worked so far?

Keem: Sometimes. Sometimes it don't – depending on my mood. When it doesn't work, might get popped. (9/5/01)

The Group Practice of Catching a Body

When respect is the commodity being sought on the streets of Philly, guns are not always the weapon used and the practice of murder does not have to occur. During the summer, I was introduced to a group ritual common to some of the inner-Philadelphia neighborhoods. In the case of *catching a body*, the status of the victim is challenged while simultaneously raising the standing of those within the attacking group of peers.

As Anderson explains,

the code revolves around the presentation of self. Its basic requirement is the display of a certain predisposition to violence. A person's public bearing must send the unmistakable, if sometimes subtle, message that one is capable of violence, and possibly mayhem, when the situation requires it, that one can take care of oneself. (p. 72)

*After a fight, we're gonna catch a body. Lay a nigga in a hotel lobby.*¹⁹

As I watched the evening news and listened to the report of a sixteen year old boy who lay in a hospital bed with a fractured skull from being beaten with a baseball bat by at least 5 of his peers, the above line to a rap, Shakeem once explained to me, replayed over

¹⁸ Sarah-Kate is a fellow researcher at the University of Pennsylvania

¹⁹ Line from *Fiesta* by R. Kelly and JZ

and over in my mind. According to Shakeem, *catching a body*, involves randomly selecting a male individual and beating him up for no obvious reason, except just to have fun. “Alright, it’s like somebody hit you and then just if a lot of people jump me. Jump on me and beat me up, right?” When you hear Randy and Shakeem speak, the occurrence of these beatings appear common, and can be described as an integral part of the system of practices that are deeply ingrained within the culture of inner city Philadelphia neighborhoods. Several references to this activity were made, in passing, by Randy’s peers throughout his ethnography. For instance: “About to catch a body! Let’s go catch a body and catch that shit on tape!” In an interview with a boy on his block, Randy asks pointed questions regarding this cultural ritual:

Randy: Is there a lot of violence around here?

John: No

Randy: I hear there’s a big bad group of boys wandering around, beatin’ up people.

John: Yeah

Randy: Why do you think they do that?

John: Just for fun.

Randy: For fun. When ya’ll get bored, ya’ll always go around beatin’ up people?

John: Whatchya mean, “ya’ll”? Alright, see I weren’t in a group.

Randy: I mean if *they* go around, whoever. Would they just be bored goin’ around just beatin’ up people?

John: I guess. If they see somebody by theyself, they go beat ‘em up. (8/28/01)

Contradiction: Groups for Social Companionship

In inner city neighborhoods, groups of youth do engage in a large range of activities that are nonviolent. On our video tour, Randy showed us shots of teenagers, mostly males, playing card games, sharing weed joints, rapping freestyle, playing basketball and riding bikes down the street. In these neighborhoods, females also congregate in groups, but they may engage in different activities. Ivory elaborates:

Not girls, they be on porches, thinking they cute and stuff. Especially around here. You'll probably find 'em at the playgrounds. That's about it. Watchin' people playin' ball. Otherwise then that, they on their porches, chillin' inside the house, playin' rope or somethin'. (8/16/01)

A noticeable characteristic of the social grouping of individuals is the mixture of ages.

Young boys appear to be taken in by the older boys. For example, Shakeem has a “son” – a neighborhood boy who is about 8 years old that he “adopted,” and Randy takes time to interact with the younger boys around his way—by helping them practice flipping through the air.

Group membership as a reinforcing symbol for respect

During my drives through the “rough” neighborhoods in West Philly, I observed young males traveling together in groups of four or five. When I shared my observations, I received immediate acknowledgment from Randy and Shakeem. Shakeem added, “In packs. Yeah, it's like you never see just one. If you do see just one, he just left his click. He on his way home.” It is rather ironic to consider the dual purpose that group membership plays on the streets. While being part of a group symbolizes security and protection, in the sense that someone's “got your back,” group practices can include rituals that terrorize and invoke fear in others. In both scenarios, respect remains in center field, as it is either being sought or defended. However, the primary purpose for group membership is not to provide an avenue for committing or warding off violence, rather violent activities such as catching a body can be simply understood as a practice that is reinforced through the symbol of a group in order to accomplish the deeper goal of *status*.

While respect of one's peers constitutes extreme importance in the street code; even more interesting is that this goal remains constant whether group members are engaged in companionship or entertainment type activities. As an example, take the basketball court, for it represents another stage for status attainment. The cultural importance of staying on top manifests in the form of tricks, dunking and shows of offense and defense talent. On the court, males and females pride themselves in their ability to pull the shades over their opponents' eyes or "fake" moves. When Ivory brought in videotapes consisting of school basketball games and some of her neighborhood's games, she constantly pointed out defensive and offensive moves that were admirable, in her opinion. The moves were always tricky, sharp and illusive. During a neighborhood competition between two girls' teams, Ivory videotaped as one of the players faked a shot at the basket. Since Ivory was following the ball with the video camera, when the girl jumps upward, with the ball aimed at the basket, Ivory reacted by jolting the camera upward as well to capture the shot. However, the ball was discharged in a totally different direction to an awaiting team member.

Ivory: Oh!! Do you see her fakin'? She faked me! No! Did you just she just faked there? Faked me? Watch how the camera go up.

Keem: Aw, she faked her [the opponent] and she faked you.

Ivory: Yeah, watch how the camera go up when she do that. Watch. Oh!! Ha ha ha!! (Everyone laughing) She faked me.

Ivory, Tim, and Shakeem would often talk about being caught or "cracked" on the court; however, in the case that a rival was successful in outplaying him/her, it became extremely important to regain the upper hand. In a game played by Tim, his

determination to increase his status on the court, after being taken down, is evident in the segment below.

The boy--the white boy-- he, I'ma admit it, he caught me good. Ain't cracked me but he just made this nice land on me. He almost like, the way he just land on the floor, right. I took my down right? So then my boy's got the ball. I was like, "Alright, give me the ball. I want the ball." I kept callin' for the ball.

Clearly, the pact or bond of a youth to his or her group is highly valued within the street culture found in my five students' neighborhoods. Moreover, one's standing with regards to one's peers can take precedence over everything else. This strong need for acceptance and high standing manifests through many different confrontational practices ranging from harmful ones like catching a body to entertaining ones like playing team sports. Moreover, such practices span across cultural fields and are evident in group interactions within the DŪS science learning environment as well.

Battles for respect within group interactions in the DŪS learning environment. I've always had a knack for picking up on spiteful treatment of an individual by his or her peers. Yet, when I first started working with the DŪS group, I was stumped. On one hand, I saw many instances where the youth would interact in ways that I would consider rather harsh, yet on the other hand, this often occurred between two of the youth that were 100% "cool" with each other. In particular, I found it very interesting to listen to confrontational conversations that occurred between Randy and Ivory whom were good friends. They had known each other for years, and had attended the same schools since Kindergarten. In the following conversation, Ivory "played with" Randy.

Akram: When did you get left back?

Randy: I only got left back in the sixth.
Akram: Why did you get left back?
Ivory: She left him back because he ain't know how to read. I swear. You didn't know how to read, Randy.
Randy: Stop playin' with me Ivory.
Ivory: She got hardly anyone left in her class, because they ain't read. They ain't have the right reading level that she wanted them with. ...
Randy: Yo, Ivory, stop coming at me like that. That ain't how I got left down neither.
Ivory: What did you get left down for, Randy?
Randy: I don't know
Ivory: Readin'.

Randy was visibly uncomfortable with this conversation, and through his comments to Ivory, indicated his displeasure with her style that publicly revealed personal information. In another situation, when Ivory and Randy are working individually to re-present their facts for the sound movie, they engaged in a similarly confrontational interchange. This time, Randy put up a bigger fight, but in the end, Ivory had the last word and again, maintained the upper hand.

Randy: Yo, Ivory you gave me one of your things [facts], man.
Ivory: I gave you what?
Randy: (Referring to the sound fact list) #27 with the air thing—
Ivory: I didn't give you #27, I gave you #10. What is you talking about?
Randy: What is you talking about?
Ivory: Cause you wrong.
Randy: No, you wrong.
Ivory: Always think you right... You don't have to do every one on there, stupo! You just do what you know—what you think you can do. You're learning, ok?

While the dynamics between Randy and Ivory were very interesting to observe, I also focused my attention upon the relationship between May and Shakeem. Again, the tension between confrontational and non-confrontational strategies of action were evident

as Shakeem picked at May, usually harmlessly, although on a few occasions, such as on the physics lab day, he would be verbally derogatory (No, you asshole!) and make a physically aggressive gesture (“Shakeem glares at May and acts like he wants to hit her but he’s holding himself back. He makes an angry sputtering sound.”).²⁰ Using the metaphor of light frequencies emerging from a prism, Shakeem, Ivory, Randy and May represent the extremes of the color spectrum. While Shakeem and Ivory would represent the fiery red, May and Randy would be more consistent with the opposite end of the spectrum or cool violet hue. For instance, while Shakeem and Ivory spoke audibly loud and forward in their interactions, comparatively May and Randy were a lot quieter. However, Randy differed from May in that he would at least engage in games of play with both Shakeem and Ivory from time to time, whereas May rarely responded to confrontation with a similarly challenging mannerism. As time progressed and I learned about the role of groups in neighborhoods as a means of establishing respect, I finally understood that the youth’s confrontational strategies of action in the learning environment were not an indication of how much May, Ivory, Randy, Shakeem and Tim liked each other and/or being part of the DŪS group. Tim confirmed this evolving feeling of group cohesion that emerged during the summer:

I worked with people that I didn't know. How can I be in the charter and don't know who is it? So all the thing was I was working with 3 people that I didn't know. I only saw 'em a few times. And it was like, there was something new. It was fun. We got close, and we was cool coming every day. (11/2/01)

Similar to neighborhood social groups, group membership in DŪS served as an opportunity for the youth to build up their image and identity. Throughout science

²⁰ See antinode/node transcript from previous chapter.

learning activities then, the object that became most important for the youth seemed, at times, not learning science, but rather building and/or maintaining integrity. As Tim once told me, “You gotta have integrity and intelligence—without that, you won’t survive” (9/5/01). More specifically, group members could easily add leverage to their own status through confrontational strategies of action that involved putting another member in a lower position, as was evident during the antinode/node misunderstanding presented in chapter four.

In their interaction, Shakeem and Ivory were clearly intent upon maintaining image and respect. In accordance, both Ivory and Shakeem insisted upon their accuracy in counting antinodes/nodes. There was a noticeable shift in intensity when Ivory told me, “Shakeem is not retarded. You don’t have to explain it to him.” Although he responded to this suggestion of deficiency in his intelligence by physically slapping the back of Ivory’s head, the damage to Shakeem’s respect and self esteem was already done. Moments later, he bellowed at May and the group interaction appeared to become increasingly out of control.

Keem: That one don’t count! (*He explicitly points to the end of the apparatus where the string extends over the pulley and a node seems present.*)

Ivory: Yes it do! One (*Ivory starts counting at the antinode closest to the pulley end and holds the string momentarily at each of the antinodes.*)

Keem: (*Voices rise and Shakeem’s attitude becomes more and more intense*)
Damn it!! Shut up! UhUh! UhUh!

Ivory: two, three, four.

Keem: Ya’ll mothafu**as have gotten me started. Look at this. Look. I’ll touch it for you. (*Shakeem’s tries to hit Ivory’s hand away from the string where she is counting the antinodes. The string falls off the vibrator once again.*) See.

Anderson's work on the street code helps to understand how this misunderstanding could develop such a heated environment when he writes, "Young boys can start off joking and wind up fighting to the death, all because of a reaction to a miscalculation that pushed the contest hopelessly off balance" (p. 90). In the physics lab example, the interaction began in a mundane manner in which both Ivory and Shakeem were reluctantly participating in a discussion centered on the string lab. Actually, before the misunderstanding occurred, I was having difficulty engaging Shakeem and Ivory in any conversations about the lab setups. However, once the "argument" unfolded, I could hardly get a word in edgewise!

While, the intensity was definitely a couple of notches too high, I believe that this scenario demonstrates how strategies of action that belong in a different place (street) make their way into the classroom and accidentally help the learning process. In this case, the object of learning (about nodes and antinodes) coincided with the object of defending respect. In fact, it was only through learning the difference between nodes and antinodes that Shakeem's respect came back intact, for only then was he able to justify his answer of "three" versus Ivory and May's claim of "four". Perhaps, with greater understandings of the strategies of action that come into the classroom from outside fields as well as the underlying objects or outcomes to be achieved with the strategies, science curriculum can be enacted in ways that engage such resources from those who embody them.

Strategies of Action from the Decent Culture

In the face of social and economic inequities and hardships, the walls separating inner city homes from the neighborhood streets are often transparently thin. As a result,

the strategies of action that appear within the home are deeply intertwined with the cultural tools that emerge from the street. This mixture of toolkits is dependent upon the outcomes valued by the family and youth, as well as what resources are available to them. Anderson's definition of the street and decent typographies is helpful for thinking about the different strategies of action that emerge in response to trying to achieve specific goals. While the code of the street values respect –which is achieved through confrontational strategies of action, the code of the house or decent typography seems to value social success, a fulfillment of social dreams through education or otherwise known as the achievement ideology. In homes dominated by such a code, there is a concern for the future and education is perceived as a valuable roadway to this social success. With all of the students in the DŪS group, the value of education has been instilled within their home environments. For example, in response to the question, “what is it that makes you want to learn?” Tim responds:

I believe that learning now is good for my future. I like to learn more so that if another students needs help, then I could help them, and my parents encourage me to do better and plus I enjoy being smarter than everybody I am around. I enjoy being on honor roll, student of the month, getting awards and love from my teachers. I am all about success. It's true. It's damn true. (7/27/01)

When asked about what she needs to know in order to lead a productive life, May's response is three simple words, “Stay in school”. Even Shakeem, whose participation was often the most challenging to summon during science lessons had been taught by his “gramma” to value education.

Keem: My gramma always tol' me, man. She say, alright, she always tell me, you know um like she couldn't go to school cuz she had to work when she was little. She said, that's why she makes sure I get here to work, and she

makes sure I get to school everyday, so I can learn. Cuz there's papers an' shit she get in the mail an' she ask me to read 'em for her cuz she don't understand some of the words and stuff. It's like that.

Row: So if that, if she's like tryin' to tell you that education is really important and to go to school, and you come here and you don't really want to learn, then does that mean that you believe that learning is just not going to really help you?

Keem: No. I think it will help because without an education ... it's all about you know what I mean, gettin' what they want ya to get. But right now, from what I see, you gotta get a degree in something. Couldn't care less what it is. As long as you got a degree in somethin', then you can get somewhere. If you don't gotta degree—if you have a high school diploma fine, alright, you might get a McDonalds job. But when you get a degree, they like, “Oh damn, he care about hisself. He care about gettin' an education. He want to pursue somethin', be about somethin', maybe we should give him the job... Arright, he came from, ya-mean, Philadelphia – the bad part of Philadelphia—and he still made it.” So, you know, I guess they figure, he tryin' ...

Although not verbalized as often by Randy, he too has been taught to believe that education is important. He wrote, “The reason science is important in my life is because I will have to use it later in life. Because if I don't know science known [now] I will not have known about who invariant [invented] things like the computer or who made the Unit State [United States] what it is today. Things like that” (8/1/01). In the case of Ivory, she is the only one of her siblings who has plans for higher education as she expressed at a seminar in September.

Basically getting' ready—well lookin' forward to goin' to college, getting scholarships off of my basketball... I'm lookin' forward to college. Right now, when I'm like, I'm just ready to start college. ...My mom she she's like, well my choice and her choice is --my brothers and them they like made it through school but they didn't make it out of school. So I guess I'll be the first one in my family that'll be actually wantin' to make it out of school all the way and go to college.

Hand in hand with an obviously strong orientation to education, decent guardians work hard to teach their children the importance of responsibility, self-reliance and hard work so that they can be successful first in school, and later, at work. Anderson further describes these “decent” strategies of action or attitudes toward life.

Such attitudes are often expressed in a drive to work “to have something” or “to build a good life,” while at the same time trying to “make do with what you have.” This means working hard, saving money for material things, and raising children—“any child you touch”—to try to make something out of themselves. (p. 38)

Attitudes of determination.

*I broke my finger playing football
Still will play any day
I play sports with injuries
but ball all the way* (Ivory, 9/7/01, life rap presentation)

When I heard this portion of Ivory’s rap, it was not my first time to learn about her finger injury playing football. Indeed, she had told me the story earlier in the summer, yet, unfortunately, I had missed the significance of it. It wasn’t until I read Ivory’s journal account from the day the DŪS group watched segments of *Men of Honor* for the Science in Movies project. In the midst of her entry, I came across one sentence that taught me a great deal about Ivory, “Him being the only Black man trying to make it just as his dream told him to, and he did boucking [breaking] leg and all” (6/18/01). In order to understand the connection between Ivory’s rap and journal entry, it is necessary to understand the story of Men in Honor. The movie, based on a true story, featured Robert DeNiro as a seemingly prejudiced, White diving instructor for the only African American man in the class, Cuba Gooding Jr. In a time when African Americans were not allowed to be divers for the US Navy, Cuba combated much adversary. Having

finally achieved his dream and while diving in the line of duty, his leg was severely maimed, and in order to keep on diving, Cuba committed the ultimate sacrifice—he chose to have the injured part amputated. Not only does the June 18th journal excerpt by Ivory further indicate the value she placed on strong-minded, unwavering attitudes toward life, it was sheer proof of her commitment, dedication and resilient cultural capital—it was a clear indication that she places herself in a category that stands above the rest. In actuality, Ivory’s dream is to go to college and play basketball well enough to become a player of the WNBA. Although, time after time, she has been told of the incredible competition, interactions with Ivory continue to reveal a deeply ingrained belief in her basketball dream.

Keem: Where do you think you’re gonna be in 2/3 years?

Ivory: Still deciding what college I want to go to--about to be drafted or my back-up career.

Keem: 10 years?

Ivory: In 10 years, I’ll be on TV then ...

Keem: When you’re 50, what would you like be doing?

Ivory: Retired. Just sittin’ back on my own house an’ just chillin’.

In another journal entry, Ivory writes about the movie, *The Right Stuff*, which tells the story of the first man to break through the sound barrier. “And at the end, 9 people out of millions sotced [succeeded] one from the military, navy, army and others,” she wrote. Although the odds are not as high, Ivory’s journal recognizes knowledge that only a few will make in it situations of high rivalry. Yet, she lives life engaging strategies of determination in search of achieving her goals.

In May’s home, she too has been taught to believe in the importance of not giving up and to dream of success. When she talks about her goals for life, she says, “I want to

finish high school and be able to go to college or trade school because when I grow up I want to be one of the two, a pediatrician or a masseuse.” In her PowerPoint ethnography presentation, May included the symbolic poem, *Still I rise*, by Maya Angelou that, similar to Ivory, indicates the embodiment of a strong attitude of determination. In explanation for her choice, May wrote,

I think the reason I picked *Still I Rise* as one of my favorites is because its true what she saying no matter how low you kick me in the dirt I will always rise. This poem relates to me because it tells me you're a winner and not a loser if they brake [break] one leg you still got one left so hop and to hop with don't let them think they hurt you and continue on.

Ivory and May have been taught not only to appreciate achievement, but to believe that they will be triumphant, even in the circumstances of poverty and hardship in which they live. Perhaps in such life conditions, it is wise to hold fast to the belief that you will be the one who will break the barrier of social reproduction. This requires, however, more than an admiration for those that keep on trying—it requires the cultural embodiment of attitudes of determination that accompanies you to every field, including the learning environment.

Strategies of determination within the DŪS learning environment. When Ivory was in the physics lab, she enacted her strategy of determination in two very different contexts—first, while she fixed her watch and second, while explaining the water pipe lab. Interestingly, during both activities, Ivory's desired outcome seemed more aligned with street code rather than decent typography. While she was fixing her “ice” and during the situation when she went to the board and presented different models for understanding the open water pipe lab, Ivory's image was at stake. This goal of

respect became evident in her manner of proudly holding up her watch to the video camera with a huge smile spread across her face when it was finally fixed: “The ice is fixed, A [Akram]! I fixed one [spring] an’ he [Randy] fixed the other.” On the board, although Ivory clearly engaged a strategy of determination when she tried to create a different model for explaining the lab after the first one was unsuccessful for the data collected, she reinforced this attitude with confrontational mannerisms and dialog. As a result, learning as an outcome began to compete with the object of gaining/keeping respect. As soon as Ivory stepped up to the board (*addressing me*), “Arright, I got the board, don’t worry about me, go ahead. ... You talkin’ about how the wave gonna look? ... Hold up, you want to see sometin? Can I do sometin? This is my own idea. (*She looks back over her shoulder directly at me.*) You don’t like it, then you just don’t like it.” For the next few minutes, Ivory ignored the fact that she is on the board up in front of me or her peers, and works hard to depict a wave pattern showing what was occurring in the water pipe, based on the data collected. As she progressed, I could see that she was developing a model that was not representative of the data, so I tried to ask questions to have her re-examine the drawing she developed. Suddenly, she stopped trying to modify the first model and instead, completely switched modes by saying, “Or, you can do it like this, check this out, I got this idea.” No longer was Ivory alone in the room at the board, she now showed acknowledgement of the rest of the group and her position as being in the spotlight. Ivory stood up on a chair to point to the number 12 written on the board, and seemed to simultaneously realize that this movement would reinforce her status. She said, “Listen!! Ivory Martin is teaching!” and began to develop a second model for

explanation, “This (pointing to the number 12) is high.” Randy and Shakeem rumbled off comments in the background. “Excuse me,” Randy said, “Who is Ivory Martin?”— “Oh we got jokes, today!?” She replied sharply. Shakeem laughed, pleased with the performance, and said “Look at that. Did you see her?” Ivory continued, clearly building status through the process of trying to learn.

Conclusion

And like one person got a problem – a problem at home and that is stressing that person out and the teacher don’t know ... and that person would think that the teacher just botherin’ them. Like if I got a problem at home and I put my head down and you come over to me and tell t’put my head up, like, I would right think that he bothered me. And I would just startin’ flippin’. Just because of my situation at home. So people bring situations outside a school to school and they just offend the teachers. (Tim, 11/2/01)

In accordance with Sewell’s notion of culture having weak boundaries, Boykin’s (1986) work addresses how the variety of experiences that African Americans have, complicates the cultural tool kit that they possess. As indicated throughout this chapter, the experiences of African Americans as an oppressed minority –manifested most clearly in poverty stricken neighborhoods-- has allowed the street culture, including but not limited to the drug culture, to become the greatest cultural force upon African American youth. In other words, regardless of whether strategies of action have street or decent influences, the outcomes or goals being sought by urban youth are deeply aligned with the street contest for respect. As expressed by Anderson (1999),

The important point here is that the kind of home a child comes from influences

but does not always determine the way the child will ultimately turn out. The neighborhood and the surrounding environmental influences, including social and economic opportunities and how the child adapts to this environment, are key. (p. 67-68)

While decent outcomes such as moving up the socioeconomic ladder are desired, such goals may seem either unreachable or a one in a thousand chance, while image and status (street objectives) may be necessary for day to day survival. Due to the nature of weak boundaries between cultures, these strategies of action, no matter where they originate, seep into learning environments as students engage them to achieve objects different from learning. Consequently, nine times out of ten, African American urban kids' cultural toolkits are not viewed as resources or capital; rather, schools and teachers see them as hindrances to the learning process.

This chapter provided examples of how particular systems of street and decent cultural practices and symbols and their underlying meanings appeared throughout the summer in my interactions with the DŪS squad. Moreover, I have shown how students' cultural tools that arise from the street or home experience were engaged in the learning environment. More specifically, this chapter has shown that May, Ivory, Shakeem and Randy's strategies of action powerfully assisted learning when the desired outcomes of the student(s) were in tune with the objective of learning physics.

Although during regular science lessons, coinciding goals was an accidental rather than planned occurrence, the creation of the DŪS sound movie was a very different story. While cultural strategies discussed in the dissertation, thus far, also appeared during the movie making process, in developing their production, learning was a prerequisite to other goals, such as respect. In the next chapter, I utilize the sound movie

production to examine issues of agency in connection to the youth's enactment of cultural resources from their homes and neighborhoods.

CHAPTER VI
EXPANDING THE BOUNDARIES OF SCIENCE THROUGH
AGENCY

When the Goal Became Learning

Row: There is this idea that, in America, if you go to school and you work really hard you can get a good job and you will be rich and set for life. Do you think that--

Keem: (interrupts) Bullshit!

Row: What do you think?

*Keem: I believe you gotta go to school and learn all you can. **You got to be able to show it.** You can't just say I can fix computers or walk around with a broke computer and say I can fix this, can I have a job? You can't do that.*

When urban African American youth come to the activity of science learning, they bring with them language, material tools, social resources and community in the form of cultural toolkits that can look very different from conventional approaches. Moreover, as is made evident in the previous two chapters, the most significant difference often lies in conflicting goals or outcomes being pursued by teacher and students in a science learning context. This chapter provides uplifting images of what science learning looked like when May, Ivory, Shakeem, Randy and Tim worked towards goals of learning in order to produce their own DŪS Sound Movie. With their richly

laden tool kits, these youth created a 40 minute movie that “*shows*” the scientific understandings they were starting to build. From walking a dog to buying music in a CD store to playing video games with friends, May, Ivory, Shakeem, Randy and Tim produced a movie that is humorous, educational, emotional and deeply connected to real world experiences typical of their lifeworlds. More specifically, the film features symbols from their cultural experiences in fields that are very different from the DŪS learning environment. Through skits, rap, dance, posters and simple props, they were able to make connections to science, and particularly to sound. Science was changing them, and they in turn were changing the image of what constitutes real science.

Contradiction: “I Don’t Like Finding the Science in Stuff; I Don’t Find it Amusing”

In fields such as the inner city neighborhood where survival of the fittest is a metaphor that many would agree upon, building science understandings is an objective that is placed at different levels of priority by youth like May, Ivory, Shakeem, Randy and Tim. As a result, as the summer began, the idea for producing the sound movie was not successful *initially*, in part due to its connection with the subject of science and its perceived association with school.

Randy: You made it sound like you was coming in and we’re going back to school again.

Row: They made it sound like I’m just gonna come in and be your teacher.

Tim: That’s exactly.

Row: And that’s not what you guys were planning on doing.

Tim: She [Ms. Rana] did not tell me that we would be doing our own research and projects and stuff. So this all just pop up as the day go.

Ivory: Basically, it like he [Randy] says. It’s school. They really--it’s like we learnin’ about science, more science and ... but I. (*Addressing Shakeem*)
Do you like science?

Keem: Uh. No.

Ivory: So that’s another reason. They don’t like science class.

Akram: But do you like science, Ivory?

Ivory: Yeah I like science class.

Keem: I like English.

Ivory: But it's just certain things that you don't need to be doin'.

Akram: Right now, does that mean that because you like science, that every time you do science, it's fun? Or is it, are you happy to be in science?

Randy: I like science

Ivory: (*Answering Akram*) No, you just gotta make it fun sometimes. (6/21/01)

Tim: Yeah, but then again I don't like finding the science in stuff. I don't find it amusing.

Keem: I planned on coming in here. You know, getting like a desk job. You know, well, not a desk job, but like being Ms. Gale²¹ flunky²² for a while, basically.

Whereas my goals for the sound movie production were for the students to: (1) learn physical science concepts regarding sound, (2) see connections to science in their everyday lives, and (3) acquaint them with video editing technology that could be beneficial on their future vitae; in the beginning, they had goals and expectations that were very different. However, as time progressed and, especially, when the filming began, there was a noticeable shift in attitude by members of DŪS, as they became more excited, motivated and focused (although this varied occasionally from day to day).

Tim: When we like on Monday, I mean like the whole week was cool but since we started um ever since, like when we started filming, that's that's when it really started being –getting better than what it was before. Cuz before, we'd just write on poster boards and have to go to the libraries and study this, do that, all that borin' stuff. Then we finally go to recordin' and stuff and that was kinda fun. (7/13/01)

Randy: Um, what I did since Monday, I did my um film stuff and then we did the sound and the wave and um how water can make the um glass make a high pitch and a low pitch, and we had some fun with it. So there wasn't really nothing bad about it. (7/13/01)

²¹ During the summer, Dr. Gale Seiler was a PhD student completing her dissertation, in which Shakeem was a main character.

²² *Flunky* refers to individuals who act as a “gopher” (“go-for” this and that).

May: Today we practiced on our skits once again. I had fun because it feels as if you're an actress plus were learning and having fun. ... I really am learning a lot more things in DŪS. (7/12/01)

As the students started to connect the sound movie creation to their own goals of having fun, establishing and/or maintaining respect, or, in some of their cases—learning, building science understandings became an outcome valued by the students as a prerequisite to their own aspirations.

Row: Yeah, well tell me specifically, ok, about like the stuff we were doing to learn about sound. Cuz like you guys say you really like the filming part, whenever you get to see yourselves, and you get to act and do the stuff that you like to do. But the part, like in order to be able to film, you got to learn some of the science stuff first. So the part when you were learning the science, that's what I want to know about.

Tim: We had to learn about it in order to do it. You can't do it an' not know nothin' about it cuz then we wouldn't be knowin' what we talking about, then we be sayin' the wrong things to the camera. Then the people, then ya'll stop it and then say it, "Naw that's not right." Then we have to do everything all over again. That's that's not that's not 2001.

Tools, Community, Division of Labor and Rule Structures

Material and human resources. The range of resources (Sewell, 1992) that the teens utilized during the creation of their movie spanned three different categories: (1) material tools for learning such as computers with internet access, physical science books, and the physics lab facility; (2) simple materials for re-presentation of learning, such as poster board, markers, and music CDs; (3) the video editing station, consisting of a computer with Imovie© software, VCR and monitor and an analog-digital converter;

and (4) human support or the community deeply involved in the study, including myself, Akram, Rana, and researchers on the grant such as Ken²³, and Gale.

Actively engaged in trying to learn. Whether Ivory was using the internet to learn about the ear anatomy which later was re-presented within a confrontational skit with Shakeem, or Shakeem was utilizing the computer to play a music CD for a movie segment on pitch differences, the hours the students ended up devoting to informally learning about the sound concepts related to their fact re-presentations and skits about sound were countless! Whereas, during formal learning sessions, I struggled to capture their attention and manage the classroom, when the youth were working on the movie production, they were focused, self-directed, resourceful, and genuine in their efforts to understand. The rule structure in place while the movie was being created contributed to the students' ingenuity in using resources. I encouraged them to use their music, rap, poetry and dance as forms of expression, and tried to support them in any way I was able. Each student utilized different resources in different manners, and what resulted was a beautiful mix of talent, cultural capital, symbols and practices from their fields of the street, home and school.

Ivory often incorporated community support in trying to construct knowledge, and always took great care to understand the concept(s) in terms of how she would present them in the film. In the example below, Ivory approached me to help her understand a fact that read, "The formula for the speed of sound is velocity equals frequency times wavelength." I suggested that we talk, first, about calculating the speed

²³ Dr. Ken Tobin of University of Pennsylvania

of a car and then, make connections to the determination of wave velocity. After we had talked for a period of time, Ivory had become intent upon the car example and trying to understand mechanical speed, all the while thinking about how this pertained to her re-presentation in the movie.

Ivory: So can I tell you what I'm gonna say for my question [in the movie]? I'm gonna be like—I'm gonna let like the [toy] car go for 5 seconds and measure where it's starting and where it ends in one foot [distance]. And um, then I'm gonna give them example, about the speed, and I'm gonna say the speed was 5 seconds—

Row: No the time was 5 seconds.

Ivory: Yeah, yeah the time was 5 seconds.

Row: And how much was the distance?

Ivory: The distance was in 1 foot?

Row: So how can we calculate the speed?

Ivory: The speed would be 1 and 5, $1/5$

Row: 1 divided

Ivory: 1 divided by 5, which is $1/5$ feet per second...

Row: So this is an example of speed of just a car. So now we're gonna talk about speed of a wave, of a sound wave.

Ivory: So I'm not gonna say this?

Row: No no no. You're right. You're just gonna start off—cuz people would understand more about a car traveling then they would about—

Ivory: And we're gonna do the car example though?

Row: You want to do that example or do you just want to use it to help you?

Ivory: No, I understand this example.

On a different day, when Tim started to tell Rana a story about his brother, an audiotape caught Ivory tuning in to information that would be helpful to re-presenting some of the facts for which she was responsible – “noise can cause hearing loss,” and “many other things cause hearing loss besides noise.”

Tim: My brother, he in the navy, and he said it's missiles that go like Mach 3 speed.

Rana: Really?

Ivory: You said Mach 3 speed will stop their hearing?

Tim: They can blow your eardrum

Rana: Really?

Tim: if they go right past your head. ...

Ivory: Chemicals the same thing?

Rana: Huh?

Ivory: Yeah, chemicals can blow your ear drum. Stickin' stuff in your ear--

In addition to engaging the support of fellow youth in the group, myself, Rana or Akram, Ivory accessed the Internet to help herself draw posters, write skits, and create her sound rap.

Ivory: (Addressing Rana) Number two says that vibrations cause sounds, and I got to explain cuz I'm gonna explain why a vibration was called a sound. And I got vibration in the air for the three tiny bones that connected to the ear drum. ... Number three says, sound travels in waves. For number three, you know what? I gonna get a picture of sound traveling in waves. (7/6/01)

In addition to Ivory, the rest of the youth were very involved in trying to learn in conjunction with producing the movie. May, Shakeem, Randy, and Tim each also devoted a great deal of time to finding information on the Internet. For instance, Randy and Tim, with the guidance of Akram, were mainly to credit for the development of the "50 Supersonic DÜS Facts" list from various websites. In Shakeem's case, he utilized such virtual sources to read about laws with regard to sound, and found ones that even pertained to dog barking and cell phones. May found information including diagrams and photographs regarding the phenomenon of hearing, the history of breaking the sound barrier, as well as ways of connecting sound and health. The following is representative of some of her research findings accompanying a diagram of the middle and inner ear. She wrote, "Did you know the human ear can't hear everything at once? Well of course everyone knows that. I even been doing research. You might want take a look at this picture that I got from Google.com of the human ear." Elsewhere, May wrote,

What is sound? Well my opinion of sound is that it's a very important part of everything human/nature and animals. A lot of people produce things off of sound like for instincts the sound barrier. The very first sound barrier was broke by Chuck Yeager. After him people begin to do it on everything like cars walls and other things. But who was Chuck Yeager? Well he was the first person that broke the sound barrier without dying. He wasn't the first to try just the first to survive from it. The military knew they could depend on Chuck when he said he didn't believe in sound barriers. After that it pushed them to sending people to outer space. That really made Chuck mad because he didn't get drafted for the test because he didn't have a degree from college.

Technology. After recording the fact re-presentations and the skits, the software, Imovie© was utilized to import particular video clips that could be edited to include only those frames that the students wished to incorporate into the movie. The division of labor began by usually having either one or two students work with Akram on the video editing setup to select the clips most appropriate for importation and to indicate the portions that should be "cropped". As time progressed, Akram allowed two students to work together without his direct supervision. Sitting at a nearby table, he maintained a low key position so as to allow the youth with the most opportunity to learn and refine their growing video editing skills. As the summer progressed, and most of the video clips had been imported, edited, and sequentially arranged, the next phase of the movie production involved adding transitions, appropriating sound effects and inserting text. The students were well on their way to becoming "professionals." Each of the youth had opportunities to work on the movie, but from the start, Ivory took the strongest interest and dedication to the project. As a result, Ivory gained the reputation of being most qualified in the video editing process, although Akram insisted that Randy and May, in particular, were just as qualified. Never, at any time, did I recommend any particular sequencing order for the movie, transitions or sound effects, although through my teaching, I provided ideas for

their re-presentation of the facts. I didn't actually watch their entire movie until the summer had come to an end; what I saw was quite astounding.

Preview from the Movie

You Don't Think That It Mean Nothin' Scientific But It Does

When I joined DŪS in July, initially, I devoted much of my attention to examining the “50 Supersonic DŪS Facts” list that had been prepared by the students, based on their Internet research. Five out of the fifty facts pertained to frequency, and as the students tried to build conceptual knowledge in preparation for the sound movie, *they* began to ask me about frequency. On their fact sheet, the students had defined frequency as “how fast the molecules are moving; the number of complete vibrations per second” or “the number of waves that pass a fixed point in unit time”. Pitch was defined as the perception of frequency of sound waves.” Building upon these standard definitions, I focused on helping the teens learn about frequency on three different levels: auditory, visual and real world. Thus, while learning to understand frequency on an auditory level, required connecting the concept to the perception of pitch, visual understandings of high and low frequencies involved being able to draw and recognize diagrams of wave patterns showing varying numbers of vibrations. The final goal was to have them begin to recognize frequency in their lives.

Check it out, right? You know when you around the block, right and you using slang, bang ghetto calls, ya-mean? You don't think that it mean nothin' scientific, but it does. Check this out when you see ya manz [friend] and you like around the

corner and three blocks ahead of you and you can't just say out his name cuz that's kinda jo²⁴, you say (*Shakeem quickly says COO four times in a high pitched voice, followed by a much deeper, Yurp*) **COO, COO, COO, COO! Yurp!** You know something like that, right now I just used um amplitude, but I'm not gonna get into it. First we gonna start with the pitch. That's how--Y'all like Musiq right SIQ [MusiQ Soulchild²⁵]? And in the song, "Love," he has a very high towards the ending of the song—he has a very high pitch and it goes (*Shakeem imitates a high pitch*) "love!!!!". And it's kind of hard to do cuz it's so high pitch and in but in the beginning of the song he starts off like (*Shakeem imitates deep voice*), "love." And that's kinda low so it's easy to get to.

In the sound movie, Shakeem developed a two-fold example to demonstrate the concept of pitch or the physical perception of frequency. He began with a type of "ghetto calling" that was recognizable to not only, May, Ivory, Randy and Tim, but any student familiar with the inner city streets. He then moved eloquently into an example of the extremes of frequency/pitch through reference to another cultural symbol popular among urban African American youth of his age, a song by Musiq Soulchild. His explanation of the difference in pitch at the beginning and ending of the song was accurate and well described, yet, in the movie, Shakeem took this re-presentation a step further by playing the song for reinforcement. However before this occurs (interjected through the video editing process), Shakeem's re-presentation was intelligently "interrupted" by two performances related to the concept of frequency. In the first, Tim demonstrated the different frequencies resulting from hitting a drinking glass and a thermos-like insulated cup. Then Randy wearing a wig made from white polyester stuffing built upon Tim's introduction by continuing to play with the glass, but this time adding water.

²⁴ Jo refers to something that is not favorable to do.

²⁵ Singer who is very popular among the youth.

Randy I have to show ya'll about a high pitch and a low pitch the water bein' in your glass. Watch an' learn. Ya'll hear it as soon as I pour the water in? (Randy pours water into the drinking glass while striking it with a metal wrench) Ok. Can I have an assistant up here? (He points around the room, teasing.) You, you, you, you. (Finally Ivory is chosen). Now can you tell me which ones is the high pitch an' the low pitch?

Ivory: Uhh, can I have a test drive? (She hits the glass with water in it and then the one without water.) Hmm, Right now, this is the low (water-filled glass), an' this is high (empty glass).

Randy That's right. Thank you very much for your time. Give yourself a pat on the back. Shoo, shoo now.

Ivory: Bye-bye, folks. Bye-bye.

Randy Ok. Aright, ok. That's all I have to show you for today. Peace an' I'm out. I gotta go get my hair done.

As Randy finished his skit, the movie returned to Shakeem who then brought the discussion back to the lifeworlds of urban youth.

Oh so um, since ya'll here again. Back to what I was getting to about the high an' low pitched voices an' stuff. Everyone, knows their own example of a real high pitched person. Show you somtin'. (*MusiQ soulchild's song "Love" comes on in the background and Shakeem mouths the very high pitched lyrics.*)

"Looooooooooooooooooooooooooooove! So many things I've got to tell you, but I'm afraid I don't know how." (*He stops the music.*) That's enough. Now we all know the high pitch, now we're gonna go to a low pitch, cuz you know my singin' is just so sicknin' like that. I rap, I sing. I do it all. Get ready for sometin. (*As the song plays, this time in a new location, Shakeem once again, mouths the lyrics in perfect synchrony in a deep base tone.*)

"Love. So many things I've got to tell you
 But I'm afraid I don't know how
 Cause there's a possibility
 You'll look at me differently
 Love. Ever since the first moment I spoke your name
 From then on I knew that by you being in my life
 Things were destined to change cause—Love
 So many people use your name in vain. Love" (*The scene closes as an imaginary audience cheers—an added sound effect.*)

Behind the Scenes of the Frequency/Pitch Productions

As with the production of any movie, the action behind the scene -- the hard work, or in this case, learning that was occurring, can not be adequately captured in the short skit or fact presentations shaping the sound movie. Thus the following sections demonstrate the process by which May, Ivory, Shakeem, Randy and Tim were making science *theirs*. Narratives from before and after the movie recording are included as essential to following their journeys in understandings.

Before filming the movie. On the morning of July 12th, I began working with May to understand frequency and period of sound waves. She was trying to finish the poster she had begun the previous afternoon about the four main parts to sound waves. I decided to discuss frequency, in terms of it being the physical interpretation of pitch so as to connect the new concept [word] to a familiar one, so I started off by asking her to think about wave patterns for different pitched sounds. We drew pictures for a while—signifying a greater number of vibrations for higher frequency or pitch and fewer vibrations for lower frequency or pitch. Then I had a thought. I found a large thermos-like cup, an aluminum tea kettle, a drinking glass, and a metal wrench, and gave May the idea to start hitting the different objects with the wrench and to take notice of the differences in sound. Tim was watching us, so I invited him to join us, and he did so very willingly. Having Tim join quickly changed the dynamics of the interaction occurring between May and me. It changed for the better, for Tim and May get along well and were genuinely interested in the activity. “Well, what would happen if we put water in the cup?” I asked eagerly after they had been playing for a while. Neither one of them responded. A few minutes later, I try again, “Ya’ll wanna try putting water in it and see

if it changes?” This time, attention shifted to the two drinking glasses as water was added to introduce a change in pitch. As May poured the water, Tim struck the glass with the wrench, and they listened as the sound acquired a deeper pitch. Then May picked up other objects on the table like a pen and marker and began striking the glasses. They noted a difference in the sounds when the “striker” and/or the object struck changed. From a distance, Randy called out, “They all sound the same,” but he didn’t venture any closer.

Row: So what’s frequency?

Tim: The number of waves in a sound.”

Row: The number of waves per like second or minute? Whatever you time—whatever time you want, you just gotta see how much those vibrations (how much of those wave crests) come.

(Tim positions the wrench in between the two glasses and moves it back and forth, hitting them quickly.)

Tim: You could make an alarm clock right?

(He starts making music with the lower and higher pitches.)

Row: So depending on what we’re hitting it with, the frequency might be a little bit different?

Tim: We’re hitting it with a solid, a strong solid—molecules is packed in this solid.

May: So like a high frequency could be like this *(May hits the thermos.)* and a low one could be like that? *(She hits the glass.)*

Row: Well which one sounds like the higher pitch?

May: This [the glass] the higher pitch, the lower frequency.

Row: No, higher pitch is higher frequency.

May: *(She hits the glass.)* This one higher pitch right here.

Row: So how do you want to talk about frequency on the thing [movie]? What would be the coolest way?

May: Why don’t you just make the waves like this?

Row: Do you have any CDs that have a woman with a high pitched voice?

(May finds a song within a few seconds – J.C. Tim is beating out a low pitched tune.)

Row: Is that (*Tim's beat*) a lower or higher frequency?
Together: Lower

Later, when Randy joined us, he took an active role by asking questions about frequency.

Randy Ya'll gonna show me what ya'll were just over here doin'?

Tim: Yeah sure. K. [OK] Frequency is the amount of waves per second or however you want to measure it. Like this is a frequency—this (*pointing to May's poster board drawing of a wave pattern indicating few vibrations*) is a low frequency because it's like Wooowooooo. (*May and Tim overlap*) This is the highest frequency. (*pointing to wave pattern indicating many vibrations*)

Tim: Woooooooh wooh. (*a little higher in pitch*)

Row: Make it higher pitch than that.

Tim: See like--

May: (*referring to her poster*) I made that looks too little didn't I? This right here.

Tim: Can you pass me a wrench Miss Rowhea?

Row: So it's about pitch, how--

Tim: See if you got this. If you hit this [glass] an' hit this [thermos], which would you think'd have the higher frequency?

Row: Which one would have more waves going by?

May: (*To Tim*) Hit it. (*Tim hits the glass once and then the thermos once.*)

Tim: This one (*taps glass*) will have the higher frequency because it's the higher pitch.

Randy Ummumm. (*He was having trouble following Tim's explanation*)

Randy Could you show me in that water, please?"

Within seconds, Randy became actively involved by pouring the water and hitting the glass himself, remarking, (contrary to his previous observation) "They did change!"

After filming the movie. Following their performances for the movie, I interviewed May, Randy and Tim on the frequency learning activities from that week. In the course of the discussion, arose the following:

Row: But if you don't know how to apply the fact to the real life, then will that help you? Like if you can't see, if you can't transfer that situation that we were doing ---where we're hitting different things, and you can't see that situation—that's why I was tryin' to get you guys to look at your music

because it's not enough just to be able to know, that I can hit the wood and it's gonna be low [frequency] and I can hit the glass and it's gonna be high [frequency]. It's – the most important thing is to be able to see that in the real world, people actually use that idea. When someone's making music, they think about that. They say, well, "Hey, I'm gonna start off real low with you know like (*I sing in a bass tone*) with the "looove" and how that guy was singing, and then he goes up high. Why? Cuz it attracts people. It draws you in. It makes you wanna listen to the music. So people don't just make up music just like that, just not without thinkin' about it, they have to know about the things about sound to be able to put it together in a certain way, so they can make the money, so they can get people to buy their albums. You're not gonna want to buy it, if it sucks.

Tim: Eminem²⁶ like stay high through the whole song.

Row: He'd stay high through the whole song? So that might be his signature? Is that the way he always does it?

Tim: No, it's just like certain songs. He versatile.

Row: So he's tryin' to show some talent, that he can go all the way up or he can go all the way down?

Tim: An' there's this other song called, *Stan*, he like use four different voices, like four different voices. Like the thing [rap] is about this fan, this real big Eminem fan—how he do stuff an' how he writin' Eminem and Eminem not writin' back. So he get mad, an' gonna kill his wife an' kill hisself. An' like it's 3 parts, it's 3 um parts for his fan, an' it's one for him. So the first part, he start off calm like, "Dear Slim²⁷, I wrote you but you still ain't callin'" Then the um second verse is um... he said, "Dear Slim, you still ain't called or wrote, I hope you have the chance. I ain't mad, I just think it's fucked up you don't answer fans." He got a little bit high right there. Then on the last one, he be like (*Tim's voice becomes harsher*), "Dear Mr. I'm too good to call or write my fans" – which make it seem like he was gettin' madder an' madder each time he wrote. So then, the last one, the last verse was like Eminem rapping as hisself an' he was implyin' like, "Dear Stan, I meant to write you sooner, but I've just been busy. Don't think I did that shit intentionally, just to diss you." Yeah.

Row: Do you think that he purposely—do you think he thought about how to change the voices, and how many voices that he wanted to have?

Tim: Yeah (*overlaps me*) Yeah, cuz he did that durin' the songs, like like he be rappin' an' then like he he'd like – he had this other song where he um he takin' his wife out to kill her. He like, he be like um he be um, "So long." (*Uses deep sad voice*)

Randy Stay real calm.

²⁶ Extremely popular White rapper

²⁷ Eminem is also known as Slim Shady

- Row: Uhuh [yes]
- Randy Cuz they talkin' to the baby an' then when he talkin' to the wife, that when he get— (*Tim starts rapping in a low whispery voice and gets increasingly louder.*)
- Tim: (*His voice, mimicking a harsh male voice, becomes audible on tape.*) “Surely, you’ll see what I’m about to do. Shut up, bitch. Why you always make me shout at you? How could you leave me an’ nothin’ out the blue.” (*Tim’s voice returns to normal.*) An’ then like in the background, it’s like you hear the girl, like (*high pitched, scared voice*) “Oh, oh!!” But that’s Eminem like screamin’ like a girl, but then when he’s made like he rappin’ an’ he’s talkin’ to the girl, an’ the girl talkin’ back, that’s him! He like um, (*Raises the pitch of his voice to imitate a sobbing woman.*) “How could you? Won’t you just take me away?” (*returns to his normal voice*) No what she say? Um, hold up. What she say? Oh yeah. (*returns to whimpering woman’s voice*) “Come on baby, don’t do this, we’re gonna take an’ leave.” Then Eminem come back and be like (*angry base-toned voice*) “Fuck you! You did this. You did it, it’s your fault!” ... I gotta let you listen to it.
- Row: Yeah, that’s the same person, so he’s like switchin’ back from a woman’s type of voice to a man’s type of voice, and like Randy said, he started out real calm.
- Tim: Yeah, he do.
- Row: So he did that on purpose. So the way the way that you change the frequency of your voice can show emotion – it can show how you feel.
- Tim: Like a lot of rappers don’t do it... they don’t change in voice. Like DMX, he he he different from all the rappers, like he be barkin’ in his song (*As Tim speaks, Randy barks one time deeply, then imitates a long deep growl twice, and finally makes too quick high pitched dog barks.*) an’ growlin’, like makin’ dog noises. (7/13/01)

These “before and after” narratives indicate the powerful role that the sound movie played in the learning process of the teens. More specifically, the above interview transcript reveals that although the students may have been originally motivated to learn for the sake of producing the movie, even after the filming was complete, they continued to make sense of the science. The application of pitch to emotional expression and indication of character demonstrates a much deeper level of knowledge construction than indicated though tapping glasses. Having built foundational definitions of frequency-

related concepts, Randy and Tim were able to not only relate to Shakeem's film performance, but also, open their own eyes to find more examples of science in their lives.

Rapping Along to Different Speeds of Sound

For me, one of the most incredible parts of the movie features Shakeem invoking his disposition of oral tradition to demonstrate understandings of the concept of wave velocities through various mediums. At the time of the filming, I had been struggling with Shakeem to really participate in the unit on sound. Even the movie hadn't provided enough motivation for him to engage enthusiastically in learning. I wasn't present when Akram videotaped Shakeem's fact on wave velocity. They had gone into my office to film in a private, quiet place. When I later sat down to watch the performance, I was stunned as I watched a Shakeem very different from the adamant young man who had insisted days earlier that sound was irrelevant to his life world where he was concerned with staying out of jail, not getting shot and making sure his family had food. Posing as a rap artist, Shakeem in the movie was animated, smiling and clearly pleased with the activity he was pursuing.

This morning, I'm gonna explain to ya'll the speed of sound in different mediums, there's three of 'em – gas, liquid and solid. An' the way I'm gonna do this, I'm gonna do a couple of lil' raps for ya'll so, ya mean, ya'll can determine the different speeds and stuff. So check it out, first I'm a do, ya mean, I'm gonna do the same rap but I'm gonna do it at different speeds so ya'll can figure out what I'm talkin' about.

(Shakeem raps at a very slow rate.)

“You might see Mark on a binge or excursion
Come to your block in the school bus swervin' ...”

Ya mean, now if that, was to say a medium, you know, that would most likely be air because it takes it just a little longer, ya mean, for sound to get through air because it has the same amount of molecules as a liquid and a solid it's just that they're more spread out. You know, I'mana gets to the second one which is liquid. Ya mean, I'm gonna speed up the rap a little bit. So bear with me. Check it.

(Shakeem raps the same lyrics, yet this time a little bit faster.)

“You might see Mark on a binge or excursion
Come to your block in the school bus swervin’ ...”

Ya mean, that was liquid. As you can see, it was a little bit faster and everything because we got the liquid and everything in there. It's the same amount of molecules as the air and you know gas and everything, solid, they're just a little bit more compact and everything. Check it, now this is where it get a little bit more complicated. This is solid. Yo. *(Shakeem plays a music CD on the computer.)* Now, ya mean, this is where it get more complicated at.

(Shakeem raps at a really fast rate.)

“You might see Mark on a binge or excursion
Come to your block in the school bus swervin’ ...”

See, now that was faster. You know why it's faster? Think about it for a second. You got it yet? This is why. You should've got it by now. Solid are compact *a lot*. They're real close together. It's like I said before with the other two, gas and the liquid, it's the same amount of molecules, it's that sound bounces off—see it's pom, pom, pom, pom. It's a lot closer together to ya'll, ya mean? Check, look out for my album, it's gonna be sicknin'. No, no don't stop the tape, no, no, no I'm talkin' to the people right now.²⁸

Learning Discussions From Behind the Scenes

The day that the difference in wave velocity was introduced, Ken was visiting the DŪS group to engage them in talking about science. I had not arrived yet.

Ken: So let's say you were about 1000 meters away. It would take round about 3 seconds for you to hear the torpedo blowing up. But it would also come

²⁸ The explanation provided by Shakeem indicates the common misconception that it is the density rather than the rigid structure of a solid that causes the velocity of sound to increase. However, this example is appropriately included in a chapter which seeks to show images of how the students brought their cultural capital to the learning and re-presenting of science.

through the water. So if you're on the water front, you would hear the explosion coming through the water in about one second. So you would hear the explosion and it would sound a bit different. It would have a slightly metallic sound to it, it would seem in my experience. So you hear, 'he' and then 'hoooooww' as it came through the air. But you would know about the explosion because that sound would whip through the water very quickly, say three times as fast. Ok?

Tim: It's like, it's like around my way, you're standing down on this corner and then way at the other corner, somebody is bouncing the ball. And you would see the ball bounce and you would hear the sound when it get back up in the air. It's like, 'bang!' (Tim bangs on the desk) 'bump' (he speaks this sound). 'Bang, bump'. And when you get closer, it start matching...

Keem: You know that happened the other night, and I didn't even realize that.

Rana: The speed of sound is like quicker in what?

Tim: Faster

Rana: Going faster in what? Solid, liquid or gas?

Tim: In, um, solid.

Rana: Why?

Tim: I don't know.

Keem: Cuz all it got to do is vibrate.

Ken: What's got to vibrate?

Keem: The sound

Tim: The sound wave.

Rana: What does the sound wave vibrate?

Tim: Whatever it go through.

Rana: Ok.

Ken: Ok. You're very very much on the track here. Sound isn't a substance. Yeah it isn't stuff (knocking on table).

Rana: So here's this piece of iron.

Ken: Yeah, so what vibrates in iron?

Rana: What stuff, what things makes up solid, liquid or gas?

Tim: Molecules.

Rana: Molecules, right. So are there more molecules in a solid, liquid or gas?

Tim: In a solid

Rana: And you said

Keem: I say, I say

Tim: Yeah, the solid.

Rana: and they're all really really really close together. That's what makes a solid, a solid, right? Gas is kind of like the molecules are spread out and a liquid is kind of an in-between state, between a solid and a gas. So when you vibrate a solid, you're vibrating the molecules—whatever you vibrate, you're vibrating the molecules inside. ...

Ken: Rana was asking a question. Did you ever answer it?

Tim: No

Rana: Sound travels fastest through which medium and why?

Tim: If I was to shoot a gun through a gas, and a liquid and a solid, I would be able to hear the gunshot through solid better?

Ken: You don't have to shoot it through the solid, the sound has to enter the solid. (6/28/01)

While Shakeem's videotaped rap performance indicates the students' efforts to understand the differences in wave velocity in terms of their own experiences and membership in other fields, surely conversations such as this one were central to Shakeem's process for constructing knowledge that could then be re-presented in terms of the cultural capital that he possessed. In fact, close analysis of this transcript reveals evidence that the students engaged their cultural capital and lifeworld practices throughout the learning process—including the period of time in which they were preparing for the movie. For instance, in this situation, Tim's ability to connect a bouncing basketball to sound velocity is very helpful to the students' learning process. While Ken was describing how a torpedo would "sound" through the mediums of water, air or a solid, Tim's example added a visual element to the discussion that was relevant to each youth sitting around the table (May, Ivory, Shakeem and Randy). In addition, it provided a type of "check" or confirmation of what Ken was describing. As expressed by Shakeem,

Yeah, cuz if you ask question, you get answers and if you get answers, you find out more stuff. You can't just sit there. That's like sayin', a closed mouth don't get fed. You don't ask questions, you gonna never know shit. You gotta you gotta challenge stuff man. If the teacher tell you the sky is blue, you gotta go outside and make sure, cuz the sky just might be black. (7/20/01)

While the kids would not be able to go scuba diving to listen to noise underwater as compared to air, something they could all do was observe a basketball bouncing from a distance. They could then see for themselves that the sound of ball hitting the ground was not reaching them as quickly as when they stood right in front of it, where the wave impulses had less of a distance to travel to arrive at their ears.

When Science Changes

Cultural Production and Reproduction

Row: So Shakeem, do you think that someone who knows science can be powerful like that having knowledge of science = power?

Keem: Science is all like—you can say science is all over. So if science is all over than basically you can get a job all over. And since there's not too many people that know about that type of stuff because of the difficulty and people are not willing to put forth the effort, then the people who are willing to put forth that effort will get the job. And it's like a lot of jobs—it's not a lot of jobs out there, but it's a lot of people that need it.

Throughout schools all across America, children are taught to use cultural symbols such as language, terminology, formulas, diagrams and accepted models for explaining physics concepts. This was not very different from what I tried to accomplish with May, Ivory, Shakeem, Randy and Tim. As I taught them to use the traditional accepted language of science, such as in the case of frequency and when I used currently accepted models for wave representation, I was engaging them in the reproduction of the culture of science. Therefore, in producing their movie, a certain amount of science culture was reproduced in the form of learning terminology, diagrams, and definitions of concepts related to sound, such as when Randy simply stated the numerical speed of sound through water and air, or when May talked about amplitude through a universally

recognized wave diagram. Yet these segments, and the movie as a whole, also presented stark evidence of cultural production. As one looks closer, at May's presentations, including her poster board drawing, for example, it is replete with semiotic symbols that are familiar to her life and also connect with the science culture. Drum symbols (the instrument) as well as pagers and "beats" for a rap appear within her presentations in the form of drawings, verbalization and special sound effects from the Imovie© video editing software.

(In this poster, May has drawn a picture of a drum symbol that indicates out coming vibrations when hit with a stick. At the bottom of the poster, she drew a pencil falling.)

Ok. I'm here today to talk about vibration an' sound. Um when you hit this symbol—if you have the drum symbol an' you hit it with a stick, you can see the vibration lines coming out when you stop it. If you make a beat (*Ivory beats on the table but the movie incorporates sound effects instead of just the sound of her fists*) real loud, maybe you can hear—sometimes you can hear the vibration sounds. Or if you have the beeper on the table or sometin you can hear it. But if it's like a short sound like a crayon or a pencil (she reaches over and drops a pencil), it's going to make a short amplitude.

In creating the DŪS Sound Movie, May, Ivory, Shakeem, Randy and Tim took science inside of them; they made it a part of their world. They found an appropriate place for strategies they invoke on a daily basis, such as oral tradition, movement, verve, confrontational/non-confrontational and determination, in a movie about science. In their cultural symbols of rap and hip hop music, for instance, they suddenly had the lens to look at themselves differently. Cultural production allowed science to become theirs, and through that process, May, Ivory, Shakeem, Randy and Tim became agents.

The Result was Agency

Agency can be exerted in three different ways: (1) when the desired outcome of an activity changes (K. Tobin, personal communication, 11/01); (2) when resources (tools) are remobilized or used in unique ways; and (3) when rules or schemas are adapted and transposed (Sewell, 1999). This chapter provides images of how science learning changes when students, who in regular learning activities were often preoccupied by objectives such as establishing and building respect, became more focused on learning. In working towards the goal of learning, the students used the resources/tools, both material and human, in clever and unique manners to produce a product that is not anything like the community of researchers involved imagined. Whereas foundational cultural schemas or scientific rules about acceptable sound knowledge were reinforced through my teaching, these conceptual frameworks did not hold May, Ivory, Shakeem, Randy or Tim in captivity. Rather, their exceptional use of resources in new ways allowed them to challenge the traditional images associated with such scientific concepts.

As agency refers to the ability of an individual to exert direction over social actions and interactions or simply, the power to act, the DŪS group was truly agentic in their production of this movie in that they have transformed science as well as transforming themselves. Such empowerment not only increased their previously low chances to re-position themselves in social space either by getting a good job or by

going on to college, it also affected their immediate capital, as can be observed in the sections below.

Social Capital from the Sound Movie

Featuring the DŪS Sound Movie! *Shakeem paid me a surprise visit on October 16th. It had been several weeks since I had last seen him. Although I wanted to catch up with his news at school, he had brought along his two friends, which made it more difficult to engage a deep conversation. Originally, Shakeem had planned to stay just long enough to say hello, but when he learned that I had a copy of the DŪS sound movie in my office, his excitement could hardly be contained. Over the next 30 minutes, I watched Shakeem build social capital in direct reference to the subject of science.*

Andy and Dawood's admiration first became apparent during the skit where Shakeem came up behind Ivory who was talking about the ways human hearing can be harmed. As she spoke, Shakeem came up from behind and hit a huge water container on the table to demonstrate the harmful effect of loud noise (which was enhanced through a loud crashing sound effect.) Enticed by the evil look on Shakeem's face, they paused the tape and then watched the clip in slow motion. According to Dawood, that segment was "the hottest jawn on the tape". When Ivory rapped about sound, Andy, asked, "That was freestyle? Oh, she'd better than me." Shakeem proudly added in, "An' she was rappin' on some school shit!" When they watch Shakeem acting as the teacher in the skit on sound, they laughed at all the right places and appreciated the typical misbehaviors that were depicted by the movie. Although these reactions were interesting, I couldn't wait to watch their response as Shakeem rapped to symbolize wave velocity through gas and

liquid, and solid. During the rap to symbolize a gas, Shakeem turned to Andy and asked, "Don't you think that ya'll would learn better if they taught you like that?" Anthony looked sort of wistful and nodded his head, yes. Then, immediately following the fastest rap, Shakeem paused the movie and asked Andy and Dawood to explain the reasoning behind the super-fast rap speed. Although they were taken aback by Shakeem's gesture to "test" them, Dawood explained, "It's a solid; because its more packed together it will travel faster." Shakeem unpaused the tape and as we listened to his recorded explanation, he seemed pleased, "See its like he [Dawood] said; it's more packed together".

Through this visit, Shakeem used his social capital now linked to the culture of science and being scientifically literate to raise his status within his own community. In the next scenario his social capital took a very different form.

Shakeem brings Charles for an interview. *I suppose I had become used to Shakeem popping up at strange times with all types of surprises, yet on the Friday that he came by with Charles, he caught me off guard once again. Although it was pretty bad timing as I was up against the wall trying to meet my dissertation deadline, I was proud of Shakeem and his attempt to exert some agency in his life. He had utilized his social capital of knowledge of the university and knowledge of someone who could offer employment opportunities (myself) to help a high school friend (who later explained to me that he needed to have a job so he could spend less time out on the streets). I knew there weren't too many positions left for hiring student researchers; however, I respected this bold step by Shakeem, and took Charles to my office for an interview.*

Conclusion

The above two situations involving Shakeem are powerful for demonstrating how different social fields intersect and how the building of social capital in one field can be agentic in that it becomes social capital in another field. For all of the DŪS youth, their participation in the sound movie was beneficial on a personal level, in terms of the scientific understandings built and the technological skills gained. On the community level, the affects of their agency extends farther than Shakeem trying to help a friend get off the streets—Already, the movie has made an impact at City High School where the ninth grade students in the SE²T SLC have not only watched the movie, but are now engaged in creating one themselves. In fact, some of the students, such as Tim and Ivory, have provided assistance in the ninth grade classes by helping the teachers.

But what I learned helped me because I am helping the teacher. I don't know what their needs are. I don't see 'em. Like they doin' the sound. They saw our tape and they ask me to help 'em out with the student. And I say, yeah that I helpin' em. And I shared the knowledge that I had over the summer, with them. (Tim, 11/2/01)

In addition, the principal of the school has planned to watch the DŪS Sound Movie and read the results of this study. Thus, as the movie slowly impacts the school, the students have become agents at the personal, community, and school levels. Yet, it is my hope that this is just the beginning, in that May, Ivory, Shakeem, Randy and Tim's actions can also affect local and state change by demonstrating that poverty stricken African American urban youth can learn science and, in turn, the science community can learn

from them. In the final chapter, the conclusions, research findings and implications for this study are examined in more detail to decide just how far this study can reach.

CHAPTER VII

SUMMARY, CONCLUSIONS & IMPLICATIONS FOR THE STUDY

Summary

What this Study was About

I think that much of the difficulty I faced had to do with the quality of the 9th graders of 2000. Many teachers throughout the City felt that the 9th grade class of 2000 was one of the more difficult ones in years. (Roth, Tobin, Elmesky, Carambo, McKnight, Beers, 2002)

This critical ethnography focused on five urban African American students, coming from economically disadvantaged homes in Philadelphia, who were considered at risk with regard to their position within society as well as within the small learning community of their low-academically performing school. Out of Cristobal Carambo's ninth grade nightmare, May, Ivory, Shakeem, and Randy were selected in a hermeneutic-dialectic manner to represent the most opposite extremes of social space. Tim was also one of Carambo's students, but he would be a senior after the summer. It was believed by their teachers as well as the SLC coordinator that they could provide the most benefit, and in turn, be benefited by becoming part of a study that would focus on science, and more specifically, their learning of physical science concepts. As participants in the study, they were employed from June 11, 2001 from 9:00 AM until

1:00 PM and continuing until September 7, 2001 at \$7.50 per hour under research grants from the Spencer Foundation and the National Science Foundation. While, through this study, these five youth were provided with traditional and nontraditional opportunities to build understandings of some of the most essential concepts of physics as learners, they also had the chance to experience positions as research assistants, teacher educators and curriculum developers. In fact, this research was unique in that it took place within the setting of the University of Pennsylvania rather than their urban high school. The objective was to create a work environment that included a wide range of tasks that were both “school” and “non-school”-related. In this way, it was believed that some of the constraints of urban teaching and learning could be reduced, particularly due to easy access to more sophisticated resources, such as libraries, computers, video editing equipment, and quick, reliable internet access. The artifacts produced by the students included the DŪS Sound Movie, ethnographic projects in the form of PowerPoint, video footage and oral re-presentations – in addition to journal entries, documents of analyzed data, transcriptions and audio-taped/video-taped interviews.

Throughout this study, the learning of physics was viewed from the vantage point of cultural capital. Instead of trying to sweep their cultural resources under the bed skirts, the focus was to learn to recognize the forms they took in the DŪS learning environment and other fields such as the home and neighborhood and how the strategies of action helped or hindered the students’ processes of making meaning of physics. Thus, this research led to understandings about the structured lifeworlds of urban African American youth, their cultural assets for learning physics, and their potential for exercising

transformational agency.

What I learned

What is occurring with regard to the students' learning of physics, and why is this happening? The findings of the research conclusively reveal that African American, urban youth from some of the most challenging situations *are* capable of learning physics concepts. Moreover, the most success (as evident in the production of the sound movie) resulted when students' strategies of action were directed toward the objective of learning although, in the process of meaning-making, their personal goals unrelated to science were also met (i.e. status through showing the tape to peers). In addition, the research results also show that urban African American students come to school with strategies of action replete with cultural practices, symbols and their underlying meanings from fields outside of school including both the home and the neighborhood. In accordance with Sewell's notion of culture having weak boundaries, the experiences of African Americans as an oppressed minority has allowed the street culture to become the greatest cultural force upon African American youth. In other words, regardless of whether strategies of action have street or decent influences, the outcomes or goals being sought by urban youth are deeply aligned with the street contest for respect. These cultural resources, when triggered, then become apparent within learning environments and can powerfully assist learning when the desired outcomes of the student(s) are in tune with the objective of learning physics. While, during the science lessons that were separate from the movie production, learning was often "accidental," however, the study also reveals that curriculum should be developed to

make these accidents the rule rather than the exception, (i.e. as evident in the success of the sound movie).

Through the physics teaching and learning that occurred within this study, as well as their work as researchers, teacher educators and curriculum developers, May and her peers had opportunities to utilize their cultural capital to build new knowledge schemas and to develop access to new resources. Consequently, evidence of agency on multiple levels was found to arise in conjunction with the youth's production of the sound movie. For all of the DŪS youth, their participation in the sound movie was beneficial on a personal level, in terms of the scientific understandings built and the technological skills gained. On the community level, already, the movie has made an impact at City High School. The students have become agents at the personal, community, and school levels. May, Ivory, Shakeem, Randy and Tim have shown that poverty-stricken African American urban youth can be changed by science and science too can be changed by their agency.

Conclusions

In an emergent research design, the questions that one establishes at the beginning of the study help to focus your attention within the research context. However, as an active member in the setting and being deeply involved in the praxis as it unfolded, some of the questions posed in chapter one became more important to the study and others blended into the background. While relationship, rapport and respect were all important

to the success of the project, in writing the dissertation, they moved to the background cultural capital dominated my lens. In the section below I address these issues briefly.

How do issues of respect become part of the interactions between the students and between the students and me? How do rapport and relationships develop over the summer?

I had only seen Ivory once since the summer ended, although I called her at home several times, just to talk. The day I met her at University of Penn, sauntering down the hallway, just off the elevator, I was pleasantly surprised and gave her a quick side hug without even thinking. Back in July, I would have never gotten away with that. In fact, when I walked in to meet the DŪS group on the first day, I could hardly get Ivory to look at me, much less maintain eye contact. We had come a long way.

In the time I spent with May, Ivory, Shakeem, Randy and Tim, I had come to know each one of them exceptionally well, due in large, to the intrusive nature of the research process. In addition to knowing what types of interactions would be appreciated and those that would not, I learned about their personal hardships encountered on a daily basis. I felt very responsible for them, often referring to them as “my kids” – my husband, Ahmed, would often, humorously, ask when these five new ones had arrived. Even after they went back to school and I stopped seeing them as often, my connections with the DŪS group did not disappear, and I feel certain that we developed rapport and relationship, without which the study wouldn’t have survived. The 3Rs (Seiler, 2001b) required that I gain social capital with them – like a filling a bucket with a dripping faucet, the process was slow—one drop at a time. One of the first things I did when I

joined DŪS was rap for Shakeem—it was a rap that I had memorized years before as a teenager, myself, and I happened to still remember a few verses. “The style that I possess, I can say that we’ve been blessed; not a rapster or a poet, I’m a lyrical profess..” From then on, Shakeem would refer to me as the “lyrical professor.” I had laid a foundation of rapport with him and the only way from there was up.

Religion. Many individuals may wonder about my “otherness” to the youth. It was most apparent in the fact that I am Muslim, and noticeably so, due not only to my dress but due to social guidelines that impact my actions particularly around males. I had never taught teenage boys before, so explaining to them why I wouldn’t hold hands and do the wave dance with them as they played with the slinky to learn about wave reflection was sometimes a little bit difficult, but not destructive to building the 3Rs. I suggest that my otherness in terms of religion played a small role in terms of the teaching process. My experiences in West Philadelphia had already shown me the profuse Muslim African American community. On a daily basis, I saw Muslim women covering even more than me—veiling their faces. Some of the youth, like Tim, had family members who were Muslim. Although questions arose from time to time, it was probably the first time that I had worked with youth so nonchalant about the way I dressed.

When being African American is not enough--when being an experienced teacher is not enough. My otherness was also visible as I did not look African American²⁹, and was not at all familiar with inner city life, the culture deeply attached to their life worlds. However, the argument about race and the tendency to anticipate that

²⁹ My mother is from Martinique and my father is Egyptian

an African American who looks Black would have been more successful becomes questionable in reading the following excerpt written by Carambo, a teacher of Cuban (Spanish)-African origin, with five years of experience teaching in inner city schools in Miami Florida.

When I met my Philadelphia students for the first time I was completely overwhelmed. I discovered that there was no area of my Black experience that prepared me for these kids. Although I had lived in the inner city as a kid, that was among very middle class Black people in another time. These kids were so marginalized, unprepared, and hostile that I was totally lost. There was no way of being an affable, friendly person, neither could I fake the militant mean person that many of them were so accustomed to. In my first few weeks, I found that there was a gruff and heavily “mean” mode of speaking that most of these kids responded to, but there was no way that I could do that. ... What eventually worked was strict, unbending discipline. I found the hardest side of myself that I could and I used it ruthlessly. I had several students expelled, one I had arrested, I exiled students regularly. It was very difficult for me but it was the only way to survive. At the same time, I treated everyone with utmost respect, even when I was hard as nails with them. (Roth et. al, 2002)

Carambo’s experience in his first year of teaching at City High captures many of my same feelings of being overwhelmed, frustrated and disillusioned this summer. In addition, Tobin (2001) cited similar difficulties in teaching within the same Philadelphia school, City High, although within a different SLC.

Each day brought with it new challenges and fresh evidence that I could not successfully enact what I knew about teaching and learning with these students, at this place, and at this time. It mattered little that I had my master’s in physics and had been a successful teacher for so long. (Tobin, 2001)

Such literature suggests that despite being the “right” color (i.e. Carambo) or having long years of teaching experience (i.e. Carambo and Tobin) their teaching habitus completely broke down when encountering teens as challenging as those I worked with over the summer. Thus one can put forth that urban school solutions then do not lie in race, color,

experience or even teaching personality. Success in educating youth like May, Ivory, Shakeem, Randy and Tim require a deeply grounded understanding of the cultural influences in their lives, the strategies of action engaged across fields, the objectives behind the cultural resources, and finally, the semiotic signs that trigger their appearance within a field.

It is in fact, my otherness that perhaps makes this study most powerful, precisely because I differ from some of the students in terms of my lived experiences, my quiet personality, my religious background, and my appearance as being white, despite my African roots. More specifically, I think my research goals as pertaining to the identification and understanding of their cultural capital, contributed to the success of the summer. In actuality, May, Ivory, Shakeem, Randy and Tim were able to learn some physics with me, there weren't any incidents of "real"³⁰ violence and the students engaged in a range of activities many would have deemed them "incapable" of doing. From the level at which they began, May, Ivory, Shakeem, Randy, and Tim grew by building new or refining old knowledge schemas of scientific concepts (cultural reproduction) as they grew more empowered as individuals through their own cultural production (agency).

What components of the students' social and cultural capital are favorable to their learning of physics? What components of the students' social and cultural capital may work adversely to their learning of physics?

My work with the DŪS youth this summer has conclusively led me to understand

³⁰ In previous chapters, I cite play rituals that appeared during the summer

that strategies of action can not be classified as favorable or aversive, for at any particular moment in time, a strategy of action could be utilized in either manner. In fact, when the objectives of the teacher are different from the students, many of their strategies of action become labeled as deficient, distracting or in need of modification. This usually occurs because a difference in object, results in different uses of resources, both human and social, by the individual (Cole & Engestrom, 1993). Even more complicated than a clash of goals is when one goal is directed toward the destruction of the other. Thus, if a teacher's goal moves from helping his or her students learn to teaching them how to behave in a mainstream manner (i.e., sit still and don't move), this may tread upon students' goals. As seen when Shakeem, in an effort of improving his disposition to orality, received a detention for tapping his pencil after being told not to move. "I swear, I can't help it. Music is such a part of me. If I'm not rappin' it, I'm writing it in my head." Being able to identify strategies of action within students' toolkits is a huge prerequisite to beginning to understand them and ultimately to learning how to funnel their energies towards learning science in a way that can be transformative.

If students are oppositional to the physics curriculum being taught, how might I as teacher/researcher adapt my teaching to create a learning environment with attractive opportunities for the students to actively participate and effectively learn science?

The success of the DŪS Sound Movie far surpassed my expectations, not in the sense of the depth of physics learning represented therein but rather in the sense of the role it played as part of the curriculum. It served as a focus—a goal to which the students

were progressing—a goal that involved learning but in a manner that allowed them to establish and maintain image through expressive individualism³¹. Moreover, although chapter six does not center on this issue, throughout the movie, there is evidence of cultural strategies that can be found within the physics lab field as well as the home and neighborhood fields, again, in accordance to Sewell’s notion of fields having weak boundaries.

Implications

Implications for Policy Makers and Curriculum

Reading chapter 4 made me think about why we are trying to teach science to students. I've come up with two reasons for why society tries to teach science. First, so that students can become scientifically literate citizens who are prepared to consider scientific and technological issues in the political/economic process. Second, to give students the opportunity to enter the scientific and technological workforces. So...do you feel as if you made progress toward either or both of these two goals this summer? (Paul Cottle, personal communication, 11/8/01)

The day I wanted to bring in the can telephones for the youth to experiment with, I wavered back and forth. I was worried that they would be scornful of the activity, saying that it was babyish, that they had done it before, or that it was “jo”. In the end, I finally decided to bring it in one setup of cans connected by string, and I presented the activity in connection to the sound movie. The following video transcript began as Tim was holding one end of the string telephone and I had the other end.

³¹“The cultivation of a distinctive personality and a proclivity for spontaneous, ingenious expression” (Boykin, 1986, p. 61).

Row: I was tryin' to think of stuff that you guys could use in your movie, if you want—that could be able to explain some of the ideas about sound that would be kind of fun for kids and stuff to watch. This is a well known one. Who wants to come over here?

Randy: Me.

Row: Ok. Randy

(Shakeem says something to Randy, and rather than Randy coming to take my spot, Shakeem does. Shakeem starts to speak to Tim through the cans.)

Tim: Hey yo, that's decent! I can hear a little bit!

Keem: What'd I say? (Smiling)

Tim: It's real—I can hear you a little bit—It's real low.

Keem: What'd I say?

Tim: I can't even make it out.

Randy: My turn. *(Randy goes and takes Tim's place.)*

Keem: Did you say something like, um did you say something—Can you hear me?

(Randy takes the can and Akram tells him to back up and pull the string tight. He holds it to his ear and is smiling. He switches it back and forth to different ears. He starts to talk into the can.)

Row: So what do you guys think we could do to make it louder?

Tim: A thicker string

Row: Um, do we have anything to experiment with? What about--

Keem: (still smiling) All I hear is da tada dat dat ta. I heard da tada dat dat ta.

Randy: You sounded like you were somebody off of Starwars or somethin'.

Keem: Yeah, yeah.

Row: Yeah? He did?

Randy: Yeah. *(Tim switches with Randy.)*

Tim: This time I gonna talk . You try to listen, alright?

Keem: Arright.

Most shockingly, the three boys, in particular, jumped to play with the can telephone.

The smiles on their faces, exclamations of excitement and efforts to talk about what was happening to the sound as it traveled through the cans, down the string to the other side was amazing to me. Later when I talked to Tim about this activity and showed him the

tape, he too recognized the genuine happiness that was in the room that day. He explained,

An' like you said before, how you wasn't sure to do this project an' this activity, one of the main reasons, this was a successful thing to do is was because in movies, in movies that we watch, they do that or the kids do that, or shows they do that. An' we never get a chance to do that. An' I always wanted to know how did they do it. This was the first time I ever do that. That's probably why it was so good, that's probably why ain't nobody gave you any little, "What kind of stuff? Why are we doin' --?"

The fact that these young adults, like Tim, have never been exposed to simple experiments such as the sound cans or the changing pitch experiment with drinking glasses and water, yet have witnessed crimes such as murder is horrific! African American urban children must be exposed to rich opportunities to interact with the science culture and begin to associate strategies of action that they embody with the learning of science *from the time they are in elementary school*. No longer should the accountability movement for math and reading be put ahead of science in the elementary grades. Reading and mathematics are not prerequisites to learning science. Conceptual science foundations can be developed without strong math skills. Moreover, for youth, like some of those in DŪS, who are struggling with multiplication, division or fractions, conceptual understandings of science are crucial to being able to understand the mathematical formulas, symbols, or diagrams that scientists have adopted to represent these concepts. One could argue that the level of engagement of the DŪS youth in learning science far surpassed the understandings held by their counterparts that are proficient in math. When students can plug numbers into the right location in physics formulas and calculate correct answers, their level of understanding could be shallow.

However, by engaging May, Ivory, Shakeem, Randy and Tim in activities that included real life examples, traditionally accepted science diagrams and laboratory models demonstrating the phenomena, required them to utilize high levels of cognition. This became evident, for example, in their ability to make connections between elementary activities—such as producing standing waves on a slinky or talking about sound vibrations across a can telephone—and the wave patterns emerging on an oscilloscope screen or discussions of the string lab. Although, in chapter four, I presented the physics lab day as one that seemed to reek of havoc, upon analysis, I found evidence that every single youth in the room was “learning”. Sometimes, the evidence lay in a single statement, as in the case of Shakeem during the physics lab: “Please. Please. Ah Damn. Turn it down.” After a minute or two, when there wasn’t a change, he clarified himself. “Yo, can ya’ll please turn the amplitude down? Please?” In a simple request, Shakeem indicated a differentiated understanding of frequency and amplitude, both of which could be controlled by the students at the lab setups. During an interaction with Shakeem about an hour before hand, we had discussed this difference:

(Randy was turning up the frequency to the maximum and then lowering it down to create a tune)

Akram:(to Randy) Put that down, man. That’s crazy loud!

(Randy continues to turn both his frequency and amplitude higher.)

Keem: Does he have the same thing I got?

Row: Yeah. See, he’s...

Keem: How come mine don’t go that loud?

Row: You know why? He’s got his amplitude up and he has a mic

(Shakeem starts turning up his amplitude)

Row: Now you’re changing you’re amplitude. Now, if you stop with the frequency, and change the amplitude, what would happen?

Keem: Nothin'.
Row: Nothin'?'
Keem: Oh wait. Hold up. (Keem puts the amplitude down)
Row: So when you put it all the way down (amplitude) it's straight (monitor shows a flat line across it).
Keem: It's like ??
Row: So what is the amplitude doing?
Keem: Aren't they all the same thing?
Row: So what does the amplitude do?

Even more powerful an example of the potential possessed by youth like those in DŪS became clear when Ivory went to teach at the board at the very end of the physics lab day. She was able to take data collected from the water pipe lab and attempt to design a scientific model that could explain the data. Whereas her first model did not accurately reflect the data and indicated the presence of some misconceptions regarding crests and troughs, her second attempt represented a unique blend of cultural production and reproduction as she expressively slid from the model she was trying to make sense of to a scientific model I had previously provided for the students regarding standing waves. When observed on a microanalysis speed of frame by frame, the level of meaning making in which Ivory engaged is hard to believe if one were to consider her reading and math skills.

If as a nation, we are serious about giving all students opportunities to enter the scientific and technological workforces, everything in this study indicates that we should not and can not afford to have business as usual. Considering the benefits gained when cultural strategies such as oral tradition, movement, and verve are incorporated into the curriculum, science textbooks and teacher support materials need to be written to identify and embrace non-destructive forms of the cultural resources discussed in this study. It is

in this manner that African American urban youth can become scientifically literate citizens who are able to understand scientific and technological issues.

Implications for Urban Students

African American urban teens coming out of inner city neighborhoods of the most devastating conditions *can* learn science. Moreover, their cultural toolkits are laden with resources that can allow them to far surpass their counterparts in high-achieving schools. If one were to consider the culture of science and, specifically, the scientists who make impacts therein, many of their strategies of action are similar to those that appear among the youth. For example, oral skills and the ability to effectively argue your point by drawing upon clear evidence is highly valued in the science culture, as are determined and confrontational means of presenting data findings and hypotheses. In fact, it is such dispositions that allow high-level physicists to make contributions that impact the culture of science itself. In school science, especially in urban schools, these strategies are not encouraged. Rather, much of the time gets spent in trying to maintain discipline and control of these same strategies of action that can be an asset in the learning process.

While I do believe that students need to be provided with strong boundaries so as to alleviate the destructive use of these strategies, i.e. derogatory or abusive verbal exchanges or inflicting physical harm, they should also feel that *who they are* is valued. Symbolic violence occurs when the school systems insist that the urban youth leave all aspects of their toolkits outside of school, as if it were a hat that could be taken off and put back on. This approach will not lead to social transformation, since when the youth

finish or quit school, they have not learned how to utilize their talents, skills, values, attitudes or dispositions in ways that are empowering.

Implications for Teacher Education

Transferability refers to the possibility of this research being transformative for both those involved in it and those who will read it. As the results of this research are directly pertinent to urban teachers, results are being shared with high school science teachers in Philadelphia's inner city schools who are involved in two studies funded by the National Science Foundation. One of those individuals reading the results from this study, Cristobal Carambo, currently teaches chemistry to May, Ivory, Shakeem, Randy and environmental science to Tim. In addition, the coordinator for their small learning community is also involved in learning from this research, and has attended seminars presented by the youth. In addition, she is reading this study and undertaking follow-up research. These individuals are all part of a city-wide urban systemic program that involves all high schools in the city; thus, I anticipate that communicating the results of my dissertation with science teachers in the fifth largest school district in the nation will be easier than otherwise might be the case. Through this large-scale process of sharing, I anticipate that other science teachers in inner-city schools will have future opportunities to learn from my research and, thereby, to be in a position to make informed decisions to the extent the study is applicable to their situations. In this dissemination process, I will not rely on spoken and written modes of communication that reflect my voice only or mainly. The students' voices will be heard in some of the products that are disseminated. For example, this is already occurring with regard to the sound movie, and will also ring

out in CDs containing vignettes selected from this study's videotapes, that show examples of the main findings of the research.

The Last Word

I'm a black ocean, leaping and wide,
Welling and swelling I bear in the tide.
Leaving behind nights of terror and fear
I rise
Into a daybreak that's wondrously clear
I rise
Bringing the gifts that my ancestors gave,
I am the dream and the hope of the slave.
I rise
I rise
I rise
(Maya Angelou, May's PowerPoint ethnography)

Through this study with May, Ivory, Shakeem, Tim, and Randy, it was my primary concern that their immediate lifeworld conditions and futures would be improved. As the main motivation for a study that is concerned with social transformation and student agency, the result has been both education and empowerment. Now it's their time to rise.

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BIOGRAPHICAL SKETCH

Rowhea Elmesky is 26 years of age, with a B.S in Elementary Education and a M.S. in Science Education from Florida State University. During her masters degree, Rowhea became interested in physics teaching and learning when she took a Physics for Science Teachers course with Dr. Paul Cottle. Striving to improve her own background in physics as well as improve the condition of science education in this nation, Rowhea decided to pursue a doctoral degree in science education, with a concentration in physics. Rowhea hopes that her involvement in this research endeavor will affect policy and curriculum decision making so that every child regardless of background or performance on standardized tests will be viewed as capable of not only learning science but also of impacting science in a dynamic manner. In addition to her academic endeavors, Rowhea is also strongly family oriented. She takes pleasure in being a lifelong companion to her best friend and husband, Ahmed, and in being a mother to their two year old son, Hadi.