

**Science and Mathematics Education Centre**

**Sociocultural and Historical Mediations on the Development of  
Scientific Fluency in the Urban High School**

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**This thesis is presented for the degree of  
Doctor of Philosophy  
Of  
Curtin University**

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## DECLARATION

This thesis contains no material, which has been accepted for the award of any other degree or diploma in any university. To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgement has been made.

Signature: Leslie Ford

Date: July 18, 2011

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## DEDICATION

This thesis is dedicated to my wife (Antonia), my daughter (MariaEloisa) and my son (Vincent) who have given me the spiritual and emotional support to complete this course of study. At moments when I thought I could not continue, their patient, encouraging words inspired and motivated me to go on. The many unasked for cups of coffee, late night shoulder massages, and laughter filled invasions of my workspace, made feel that I was always in their hearts and minds. Although I spent many hours away from them, their faithful attention and interest in my progress was a constant reminder of their love we have for one another. The completion of this thesis is a testament those affections that will forever bind us together as ‘La Familia Carambo’.

A year before beginning this course of study, my mother Eloisa Scull passed away. There are no words to describe the importance of her presence in my life, for she loved me without bounds and without conditions. Although we were often separated by life’s many tribulations, she was always my greatest advocate and source of personal strength. Although she is no longer here, her unconditional love remains as a source of solace and companionship in my darkest moments. I dedicate this thesis to her, as she is ever present in my life.

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## ACKNOWLEDGEMENTS

It is with deep sincerity and humility that I acknowledge the many individuals who have supported me during the writing of this thesis. It is an undeniable reality that without the array of supportive family, friends, and colleagues, I would never have been able to complete this endeavor.

Of these many supportive colleagues, Dr. Kenneth Tobin stands as the principal source of professional, philosophical, and intellectual guidance, as he has been my teacher, mentor, and co- (teacher-researcher) for well over a decade. It was his influences during my early years as a graduate student that initiated my career as teacher researcher and it has been his unswerving support, provocative intellect and cheerful friendship that has given me the motivation and confidence to pursue this doctoral degree. It is with heartfelt thanks that I acknowledge him as a fellow educator and treasured friend. It is also necessary to note a second decade long friend who has provided me unfailing support and encouragement. It was Professor Barry Fraser who, (along with Dr. Tobin), suggested that I enroll in Curtin. During the ensuing years, Professor Fraser worked tirelessly from his home in Australia to facilitate all of the administrative requirements and protocols necessary to complete this thesis.

Included within the body of colleagues that have supported my growth as teacher-researcher are the many members of the DUS research community. Although the group disbanded many years ago, my connectivity with them remains an essential component of my ongoing development as critical educator. Of these, I would single out Dr. Sonya Martin, Dr. Rowhea Elmesky, and Dr. Kathryn Scantlebury as supportive colleagues and close friends. Since the inception of the DUS, each has given me evocative, insightful critiques of my work as writer, researcher, and teacher. Their insights served to catalyze many transformative moments in my work as educator and during the writing of this thesis.

Dr. Martin has been especially important to my development as post secondary educator as she has actively recommended me to several teaching positions at area institutions. These positions were extremely helpful as they provided valuable resources that allowed me to continue my research efforts. We have also co taught

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many science classes, collaborated on a variety of grants, research efforts, and presentations at national conferences. The complex of these many professional activities have been invaluable to my development as educator, researcher and to the writing of this thesis.

I am especially thankful to Dr. Scantlebury's analysis of my teaching style as her insights (along with Dr. Tobin) helped me understand how my teaching practices were marginalizing students within my classes. Her feminist perspectives provided our research community a critical lens on praxis that ensured that our activities were truly inclusive and free of unintended discriminatory practices. Her voice remains as a vital component of my ongoing work as teacher- researcher.

Dr. Elmesky is my oldest acquaintance within the DUS as I met her during my years as graduate student in Florida. She is perhaps more central to the successful completion of this thesis as she was the co-researcher on many of the more important papers of the DUS, and she videotaped countless hours of my science classes. She was a regular member of my chemistry classes, wherein she formed many long lasting friendships with my students. It is for this reason that her voice is included in this thesis, as she possesses a unique perspective on my work as educator.

During the time of the DUS, many visiting educators engaged in collaborative research efforts in our small learning community. Each of these co-researchers, enriched the teaching | learning in my classroom. Of these, Dr. Wolff-Michael Roth and Dr. Stephen Ritchie made vital contributions to the transformation of our learning community. Dr. Roth's research (along with Dr. Tobin) on coteaching, cogenerative dialogues, and identity form a major portion of the literature that structures this thesis. His presence in our learning community initiated many of the important structural changes that enabled the ongoing transformation of my praxis.

Dr. Ritchie's research occurred after the research period for this thesis, however his study of the distributed leadership practices in the SEM academy increased my understanding of the role of emotional energy within transformative learning environments. The sociology of emotions has since become complementary to our

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existing cultural sociological perspectives, and is currently the focus of my ongoing research.

This research was also facilitated by the many supportive relationships with fellow teachers and school administrators who formed the fabric of my teaching experiences at City High. The most important of these was with my coordinator, Clare Tracy Stickney as she helped resolve all of the major obstacles to my successful integration into the school community. It was she that I turned to during my most difficult moments as educator, and it was her understanding and genuine respect for all children that gave me the insights needed to effectively communicate with my students. During our many years of collaborative practice, she never failed to support me or constructively critique my teaching practice. Although we no longer teach together, she remains a trusted confidant and one of my closest friends.

In January of 2001, two coteachers (Jen Beers & Brian McKnight) became part of my classroom community. Their presence provided me the resources that helped initiate my enculturation as a member of the SET small learning community. Since that time many other coteachers have contributed to the teaching | learning in my science classroom. Two of these (Mr. Chris Dalland, and Mr. Ian Stith) are central to this thesis. Mr. Chris <sup>1</sup> co-taught my chemistry classroom and led the Labs at Penn project during the 2001-2002 school year. His contributions to our community are detailed in chapter five of this thesis. Mr. Stith was the mentor teacher for Matthew during his work on his motor project. His work as co-teacher is detailed in chapter six of this thesis.

Lastly, I would like to acknowledge the many engaging, and challenging students that I have had the privilege of teaching at City High school. My experiences with them enriched my life and provided me the opportunity to learn more about myself as person and as educator.

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<sup>1</sup> Mr. Chris is the name used throughout this thesis to refer to Mr. Dalland.

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## **ABSTRACT**

This thesis opens with the story of Matthew and his electric motor to illustrate the exemplary science learning that occurs when careful attention is paid to the cultural, social, and emotional dimensions of the learning environment. Matthew's story and the other narratives of exemplary learning documented in this thesis evidence the exceptional intellectual skills and academic potential of inner city urban youth. It is however unfortunate to note that while these displays of scientific fluency are indicative of their inherent possibilities, the stark reality is that most students in this large comprehensive high school (and in many inner city urban environments) have failed to achieve at a level consistent with their academic potential. This "academic underachievement" of children from the inner city has occasioned a national fixation with mandated curricula, prescriptive teacher practices, and normative performance on standardized high stakes assessments. The spate of reform initiatives that structure educational policy in our nation's inner cities (and especially in the School District of Philadelphia), are informed by deficit perspectives that tacitly blame students, their families, and their communities for their academic difficulties. While many of these policies are well intentioned, they fail to consider the effect that historical processes of sociopolitical marginalization and economic inequities have had on the quality of educational opportunity offered to children within inner city urban communities. Moreover, by focusing narrowly on institutional and curricular concerns these policies fail to consider the profound effect that culture, social interaction, and emotional energy have upon the enacted curriculum.

This thesis juxtaposes narratives of discordant, symbolically violent encounters between teacher and student (and their resolutions) to illustrate the impact that cultural misalignment has upon our efforts to provide transformative educational opportunity to urban youth. The events chronicled within this thesis, suggest that the best-intentioned learning environments are often destabilized by cultural miscues and misunderstandings between participants unable to effectively communicate across cultural difference. Although I am the same race and from a similar socioeconomic history as most of my students, my first months in City High were a time of fractious, contentious encounters because my students construed me as a cultural other. Not until we were able to bridge this false cultural divide did we interact in ways that fostered trust and mutual respect. Once established, these

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interstitial cultural resources provide the foundation for successful social interactions that engendered positive emotional energy and solidarity with the culture of the school science community. It was within these learning environments that students were able to deploy their rich stores of cultural, social, and symbolic capital to learn science in ways that were personally relevant, meaningful, and transformative in their lives.

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*Moving we confront the realities of choice and location.  
Within complex and ever shifting realms of power relations,  
Do we position ourselves on the side of colonizing mentality?  
Or do we continue to stand in political resistance with the oppressed, ready  
to offer our ways of seeing and theorizing,  
of making culture toward that revolutionary effort which seeks to create  
space  
where there is unlimited access to the pleasure and power of knowing  
where transformation is possible?*

(hooks, 2004, p. 153)

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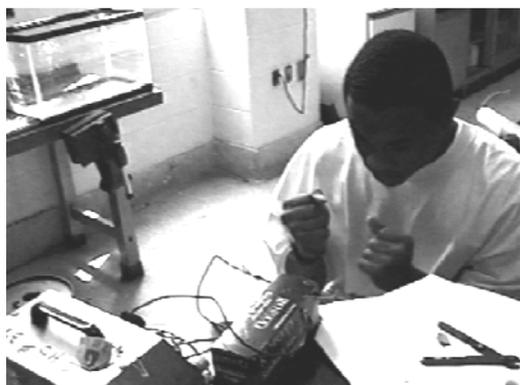
CHAPTER ONE  
THE PROMISE AND THE CHALLENGES OF TEACHING  
SCIENCE IN THE URBAN SETTING

1.1 MATTHEW AND HIS ELECTRIC MOTOR

*June 6, 2003.*

It is late in the afternoon on one of the last days of the school year. The class has emptied as the majority of the students in my chemistry class have completed their end of year projects. Matthew however has remained behind: he is still working on his project to build an electric motor. This is his third try: as his previous models have all failed. He reshapes the coil of wire that serves as the armature as it does not sit correctly on the contact points. He discovers an error in his wiring.

00:27:14: “Oh, that’s why it ain’t working.” He adjusts the clips, cleans the contact points, rechecks everything, and turns on the power.



2:14:04 The coil of wire spins: he raises two clenched fists in a gesture of success. A silent, private “Yes” communicates the pride in his accomplishment. His success however, is short lived as the motor stalls. He pauses for a moment, then confidently readjusts his connections,

rechecks the circuit and voltage settings. He turns on the power and the coil begins to spin freely once again.

03:17:20: “There it goes,” the motor works but the motion is halting. It stops and starts in bursts of motion: the motion is not continuous. Matthew has stayed after his regular class time because he feels he is close to success. Although his previous attempts have not succeeded, this day may prove different. He continues to adjust his setup.

04:11:23: The motor finally achieves a continuous steady spin. He gives a slight celebratory dance moving his shoulders about.

04:14:25: He looks up (toward and unseen audience) and gestures to his work “See that?” He watches the spinning coil for several seconds, smiles, and remarks to himself:



4:18:25: “That’s decent.” He beams a broad smile of contentment.

4:23:23 He looks up at us, smiles and points once again to his accomplishment. His look conveys self-satisfaction and pride in his intelligence.

4:24:07: “That’s decent. Yo! I did it!” He raises the voltage to the circuit.

4:31:02: His voice rises in surprise. “It can go faster!”

4:41:04: The motor continues to spin efficiently: “That’s decent.”

4:57:34: Sparks begin to fly, wires are overheating: the voltage is too high. He lowers the current, and sets the motor to work again. I am at the far end of the room: Ian, the physics teacher, is nearby. He calls out to us:

5:06:44: “Hey I worked it. I finished it.”

Mr. Stith and I walk over to his workstation. We are all extremely happy with his accomplishment, as he has worked diligently to achieve success. We chat briefly about the motor and make plans for the write-up of his project. Surprisingly, he is not through. He wants to return the following day to adjust his motor, and assemble a few examples of his electromagnets to show the class. As I watch the other videos of Matthew’s project,<sup>2</sup> I am struck by his extraordinary curiosity and how a simple question has evolved into such an exemplary display of scientific fluency. His original interest in the technology of a coil gun had evolved into an exploration of magnetism, electromagnetism, and finally motors. To get to this point, he had consulted with an engineering teacher on our floor, the auto mechanics teacher in another small learning community, and Mr. Stith, the physics co teacher in our

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<sup>2</sup> A narrative of Matthew’s motor project is detailed in chapter six of this thesis.

learning community. In order to gather background information, he had studied not only our class textbook, but also our school's physics textbook and two AP science textbooks: (Giancoli's (2002) *Physics* and Brown and Lemay's (2002) *Chemistry the Central Science*). He had fashioned his most efficient electromagnet in the auto mechanics shop where he could cut metals that he needed and the electrical sources were more efficient. By this point in his work, he could deftly handle all of the wire cutting materials, the VARIAC (which he found most inefficient), our voltage meters (analog and digital) as well as the various grades and types of wires he used in assembling his electromagnetic artifacts. He could use the concepts of magnetic domains to explain why some metals are magnetic (he used his hands to illustrate the random arrangement of the domains in non-magnetic materials, thence show how they lined up once the material had been magnetized). In his conversations with Ian, he regularly used the terms; magnetic fields, electron flow, metals, and non-metals, to explain the science of ferromagnetic materials.

The following afternoon Matthew returns to his workstation to perfect his accomplishments. He rewinds the coils of his various electromagnets for his demonstration. He is not happy with the cardboard box that serves as his motor housing, so he fashions a new one from K-Nex© pieces students are using to build a roller coaster. He takes a few minutes to refashion the motor on its new housing. Then he sets it to work. The motor spins efficiently. Sitting back against the wall he beams another broad smile and says, "That's decent; I'm real happy with this."



### *1.1.1 Matthew's Promise and His Challenge*

This project would be one of Matthew's few academic accomplishments in my chemistry class as he had failed the first grading period and received a relatively low

grade for the year. He would eventually leave our learning community and transfer to another with a less demanding course schedule. During his senior year, he would need to take remedial courses in the twilight program in order to acquire enough credits to graduate. He graduated, but only with the minimum number of credits as his academic record contained so many failures.

Although one might dismiss the success of his electric motor project as a one time anomaly, Matthew's commitment, perseverance, and level of scientific fluency in light of his academic history is a contradiction that I as educator cannot overlook. It is a contradiction that has repeated itself many times during my teaching at City High school and it is documented in the writing of other researchers who have worked with our student population (Tobin, Elmesky, & Seiler, 2005). Matthew's story, and those of the other students in our<sup>3</sup> research literature, suggests that we are losing the opportunity to provide a transformative education to many gifted, curious, and deserving students who are capable of making meaningful contributions to our society and the life of their community.

It is a simple statement of fact to say that the country's future depends on finding ways to prepare groups of students who have traditionally fared badly in American schools to perform at much higher levels and to prepare all Americans to live and work in a society vastly more diverse than ever in our past (Orfield & Lee, 2007, p. 4)

Our collaborative research with these "underachieving students" has shown that careful attention to the social, cultural, and affective dimensions of teaching | learning<sup>4</sup> can foster educational environments that enable students like Matthew to overcome the limitations of a lifetime of academic underachievement. The fact that he (and others like him), have such possibilities but as a group continue to fall behind their counterparts in all measures of academic achievement (Braswell, Dion, Daane, & Jin, 2005), is a reality that critical educators everywhere must confront and correct (Barton, 2001). It is a reality that problematizes the teaching of science in the urban setting (Norman, Ault, Bentz, & Meskimen, 2001) and it is the central issue that motivates the writing of this thesis.

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<sup>3</sup> My work as critical educator is contextualized by my participation in the Discovering Urban Science Research group (the DUS: hereafter). The collective term "our" reflects my continuing connection to the community of researcher-educators.

<sup>4</sup> The Scheffer stroke ( | ) is used throughout this thesis to denote dialectical relationships.

### *1.1.2 Dialectical Relationships*

The Schaffer stroke ( | ) (Roth, 2005) is used throughout this thesis to indicate constructs that are dialectically related. Dialectical relationships juxtapose perspectives, actions, or concepts that mutually presuppose and / or constitute each other (Roth, 2005). Thus while the constructs in a dialectical relationship may seem contradictory or independent of one another, they cannot be fully conceptualized in isolation for they are each part of a dynamic process that unifies the two entities into a more comprehensive whole that promotes ongoing development and change (Roth, 1999).

Teaching is a social activity, which is itself constituted by the community of learners in which teaching is occurring. Thus while the teacher is delivering content instruction, he is also re-learning the import of that content, his pedagogical beliefs, and himself in relation to his ever changing sociocultural context. Teaching | learning are dialectically related because in each instance of teaching, the teacher is actively learning (his students, the context of the learning environment, the content in relation to his students, himself in relation to his cultural context, the social history of the community in which he is teaching, etc.). Without these simultaneous actions of learning, effective, transformative teaching cannot occur.

## **1. 2 PERSPECTIVES ON URBAN SCHOOLING**

### *1.2.1 Academic Realities in City High*

Matthew 's academic record is unfortunately, not uncommon in City High School as school records show that a majority of the students consistently fail to reach most academic goals. As a result, the school has failed to meet any of the benchmarks required by the Pennsylvania Department of Education or the (No Child Left Behind) legislation since the inception of measures of adequate yearly progress. Student scores on the PSSA<sup>5</sup> (Pennsylvania Standardized Student Assessment) have been well below the state averages since 2002. In 2004, the school was placed in "Correctional Stage I" status after failing to achieve AYP (Adequate Yearly Progress) from 2002 through 2003. After failing to make "safe harbor" in 2004 and 2005, the school was placed in the Carr Region: (a special region of the school

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<sup>5</sup> The Pennsylvania State Standardized Assessment is the state of Pennsylvania's yearly assessment of academic progress in its schools.

district for chronically poor performing schools). Tables 1.1 and 1.2 compare the scores of City High school students in mathematics and reading to state averages for the years between 2002 and 2006.

**Table 1.1 City High School Mathematics PSSA Results (2002-2006)**

Year	ADVANCED	PROFICIENT	BASIC	BELOW BASIC
	C.H.S	C.H.S	C.H.S	C.H.S
	State Average	State Average	State Average	State Average
2002	0.0	6.7	22.7	70.8
	27.7	26.9	21.4	29.0
2003	1.1	9.7	14.7	74.5
	20.6	26.3	21.9	31.2
2004	1.5	9.4	12.1	77.1
	35.1	28.1	20.7	16.1
2005	2.5	9.1	14.9	73.6
	26.3	24.6	18.7	30.5
2006	2.0	6.0	12.0	78.0
	24.4	23.4	18.2	32.2

**Table 1.2 City High School Reading PSSA Results (2002-2006)**

Year	ADVANCED	PROFICIENT	BASIC	BELOW BASIC
	C.H.S	C.H.S	C.H.S	C.H.S
	State Average	State Average	State Average	State Average
2002	1.9	12.8	27.5	57.7
	15.7	43.3	21.3	19.7
2003	0.1	14.5	22.3	63.1
	18.2	39.4	20.2	22.2
2004	0.9	12.2	22.9	64.1
	36.2	34.6	17.2	11.9
2005	2.6	13.8	13.8	69.9
	33.6	31.4	12.9	22.0
2006	1.0	14.0	25.0	58.0
	28.3	33.6	16.8	19.4

**PSSA Data:** (Pennsylvania Department of Education, 2006)

The city's yearly report card on public schools, which measures the overall quality of educational opportunity consistently, places the school in the lowest tier of the Philadelphia public high schools (Philadelphia Inquirer, 2002). The grade 11 Scholastic Aptitude Tests further illustrates the academic underperformance of the students in this school. Table 1.3 compares scores of City High school students for

the 2001 school year to those of other schools in the Philadelphia school district and throughout the state.

**Table 1.3 City High School SAT Data**

School Category	Math	Verbal	Overall
Special Admission School	573	580	1350
City High School	311	324	635
School District Average	420	416	836
State Average	499	500	999

**SAT Data: (Pennsylvania Department of Education, 2001)**

Academic performance data suggests that there are many challenges that must be addressed if we wish to provide transformative educational opportunity to students in this school. Although Matthew’s success on his motor project evidences his intellectual ability, the stark reality is that he and the majority of students in City High have historically performed well below their academic potential.

*1.2.2 Deficit Perspectives*

The academic performance of students in City High, if viewed from a deficit perspective, represents to many, the kind of “unmotivated, under performing student” documented in the national data on children from the urban setting (Braswell, et al., 2005). Citing legislative efforts that have supposedly equalized educational opportunity, deficit theorists place the blame for underachievement on students and their families (Fine, 1991), suggesting inherent pathologies in their lives as root cause of their academic difficulties (Boykin, 1996). National educational policies (such as the No Child Left Behind Legislation) and local “reform initiatives” (such as the PSSA and the Philadelphia School District’s mandated core curriculum) perpetuate deficit perspectives. These policies are informed by a theoretic which suggests that institutional components of school reform, (such as, continual normative standardized assessments (Sanders & Horn, 1995), formulaic teacher practice (Sanders & Rivers, 1995), and regimented curricula (Wright, Horn, & Sanders, 1997), are the best (and only) methods through which to improve the academic achievement of minority student populations (McNeil, Coppola, Radigan,

& Heilig, 2008). Implicit in these reform efforts is the belief that the correct mix of strategies and prepackaged curricula is all that is needed to address academic underachievement since it is the students' (intellectual, social and linguistic) deficiencies that are the sole cause of their underperformance (Rothstein, 2004). Such a reliance on technocratic instrumentalist methodologies obscures the complex forces that problematize urban education (Bartolome, 1994), and implies that there is no need to interrogate the cultural imperatives of schools (Fordham, 1996), the socioeconomic conditions that constitute life in the inner city (Kozol, 2005), or the political history of schooling in our nation's inner cities (Anyon, 1997).

Portraying disproportionate school failure among Black and Hispanic youth in terms of personal troubles or cultural deficiencies sustains public policies that emphasize individual self interest and personal responsibility...leaving no reason to consider the effects of poverty and discrimination or underfunded schools and deteriorating facilities on children's learning (Dudley-Marlin, 2010, p. 3)

The current educational reform initiatives at work in our nation's inner city (and in City High school) are therefore theoretically underpowered (and ahistorical) as they focus solely on mesoscopic concerns (student underperformance, teacher practice, curricular and institutional policies), but fail to recognize the macroscopic structures that constrain teaching and learning in the urban setting (Orfield & Lee, 2005).

### *1.2.3 Social Historical, and Cultural Perspectives*

#### *1.2.3.1 Social Historical Perspective*

Social, historical perspectives frame my analysis of the academic challenges in City High school, because an exploration of these dimensions foregrounds the sociohistorical narrative that contextualizes the school and the community in which it is located. A critical analysis of the history of West Philadelphia chronicles the economic policies and sociopolitical initiatives that have structured the persistent poverty, racial segregation, and social isolation that characterize life in the area's black neighborhoods (O'Mara, 2005). Recent census tract data<sup>6</sup> documents the ongoing deterioration of these neighborhoods as the percent of families living below federal poverty level, unemployment rates, crime, and the numbers of vacant

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<sup>6</sup> A detailed analysis of the demography of the neighborhoods in City High school's feeder pattern is presented in Chapter two of this thesis.

blighted properties continue to increase (Garofalo, 2008). The intensifying economic deterioration has occasioned the continuing outmigration of middle-working class residents (Lloyd, 2008) which, (together with expansive urban renewal initiatives), has isolated the community's poorest residents into ever diminishing geographical spaces.

The persistent structural poverty of these neighborhoods has eroded the community's ability to provide adequate funding for its schools and educational programs. As a result, the schools that service West Philadelphia's black communities are underfunded and lack the requisite human and material resources needed to maximize student learning potential. Conditions within these schools mirror the demography of the surrounding communities and offer clear evidence that the socioeconomic and political realities that configure the lives of urban residents also constrain the quality of educational opportunity offered to their children (Kozol, 2005).

#### 1.2.3.2 Sociocultural Perspective

The history of economic and sociopolitical constraints has also profoundly affected the culture<sup>7</sup> (schema and associated social practices (Sewell, 1992)) that has evolved within these inner city urban communities. While it is important to note that there is considerable variation in the cultural perspectives of urban populations (Anderson, 2000), it is a documented reality, that the culture that structures and orients life within persistently poor, segregated neighborhoods differs in many respects (Anderson, 1999), from the dominant cultural themes that inform the school's institutional policies (Davidson, 1996), and the cultural perspectives of its teaching staff (Roth, Lawless, & Tobin, 2000). The convergence of varying cultural perspectives in the urban science classroom problematizes teaching | learning as teachers and students attempt to interact across cultural difference. The inability to (respectfully) communicate | negotiate across difference can lead to fractious, contentious encounters that produce the violent and resistant oppositional culture that so often destabilizes learning in urban schools. A critical awareness of the sociohistory of the communities in which our students live and grow sensitizes us to

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<sup>7</sup> The concept of culture is a central theoretic informing this thesis. The concept will be introduced in section 1.3 of this thesis.

the realities that constitute their lifeworlds and helps us to fully understand the cultural codes that inform their social practices. It is our understanding of our students' cultural perspectives (and of our own cultural narratives) that help us avoid actions that disrespect or marginalize them because of their difference (Norman, Ault, Bentz, & Meskimen, 2001).

[If] teachers develop insights into the cultural orientations of minority students, classroom tensions in urban science classrooms may be significantly reduced, and learning enhanced. Such insights joined to an understanding of the history of becoming a minority provide teachers with the ability to interpret actions from their students from multiple and, ultimately deeply respectful ways (p. 1110)

It is therefore the combination of social, historical, and cultural perspectives that expands our understanding of the complex forces that constrain teaching | learning in the urban setting. The complexity of the challenges in schools such as City High, suggests that there can be no “one size fits all theoretic” that will resolve the many issues that complicate the work of the urban educator. Thus unlike deficit perspectives that focus narrowly on institutional policies and curriculum, our historical sociocultural framework suggest the need for an array of structures that address the social, cultural and emotional dimensions of the learning environment.

#### *1.2.4 Centrality of Respect in the Urban Classroom*

Although I will propose a variety of structures that are essential to exemplary learning environments, mutual respect for all participants is, from my experience, the essential component of our efforts to provide transformative educational opportunity to urban youth (Ladson-Billings, 1999). Any attempt to address the academic challenges in the urban setting must first begin by establishing a learning environment wherein difference is genuinely honored and respect is actively and continually co-constructed (Tobin, 2006). For it is within social spaces characterized by trust and mutual respect, that students are able to fully deploy their rich stores of symbolic, social, and cultural capital to learn science in ways that are relevant, personally meaningful and transformative in their lives (Pitts, 2007). Matthew's exemplary performance on his motor project was enabled by a variety of structures within our science classroom however, the most important of these was the trust and genuinely positive emotional energy, which brought the three of us together in the

late afternoon of one the last days of the year to successfully complete his motor project.

Our attention to the sociocultural and affective dimensions of teaching | learning is not meant to negate the importance of meso-level concerns with the quality of pedagogical practice, well-structured curricula, or proficiency on standardized assessments. These are necessary and important components of rigorous learning environments; however, the exemplary science learning documented in the work of DUS has occurred when these mesoscopic aspects of the science curriculum were informed by our critical awareness of the sociohistorical contexts of our schools and the culture of the communities in which our students live and grow.

### *1.2.5 Context of Urban Schools*

The large comprehensive neighborhood schools (such as City High) that serve children in the inner cities suffer from a host of deficiencies such as crumbling infrastructures, transient poorly trained educators, meager budgetary allotments (Kozol, 2005), and an impoverished curriculum that is aptly described as, “a pedagogy of poverty” (Haberman, 1991). A comparison of the 2000-2001 per pupil expenditure in Philadelphia’s public schools and in suburban schools obviates this inequity. Budget data shows that public suburban schools spent an average of \$13,150 per pupil<sup>8</sup> while inner city urban public schools (such as City High) allocated only \$6,969 per student (Bishop, 2001). A similar comparison of the 2007-2008 per pupil allotment shows little increase in the City High school expenditure to \$7,459 per student (New America Foundation, 2008), while the average for the suburban districts rose to \$23,444 per pupil<sup>9</sup> (New America Foundation, 2008). These budgetary differentials and the resultant inequity in human and material resources evidence the reality that urban schools do not offer equitable educational opportunity to minority children (Fine, 1991),

In complex ways, urban comprehensive high schools do not serve public interests. In gross educational or economic terms, the evidence is most

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<sup>8</sup> Per pupil, average based on the 2000-2001 per pupil expenditures of the Radnor Township (\$13,288), Upper-Merion (\$13,139) and Jenkintown (\$12,076) school districts. These school districts are located in the suburban areas surrounding Philadelphia.

<sup>9</sup> Per pupil, average based on 2007-2008 per pupil expenditures of the Radnor Township (\$24,063), Upper-Merion (\$16,377) and Jenkintown (\$29,893) school districts.

compelling. The resources allocated to comprehensive high schools are inequitable relative to more privileged schools, and even more inadequate considering the academic and social difficulties many of these youth experience (p. 203).

The disparity in educational opportunity between urban schools and school in more affluent educational communities reflects the historical inequality between the privileged in our society and the marginalized urban poor (Kozol, 1991). Schools mirror this inequity as they are the products of the same economic and sociopolitical forces that have structured the persistent poverty and class based isolation that characterizes life in our nation's inner city urban environments (Bowles & Gintis, 1976). Given that schools represent the cultural imperatives of dominant institutions (Bourdieu, 1974) it is not surprising that they would fail to offer equitable educational opportunity to minority student populations (Fordham, 1996). It is a disturbing reality that most inner city urban schools often work to reproduce the limited life choices and marginalized status urban residents have experienced their entire lives (Macleod, 1987). The history of City High school (Oliff, 2000) suggests that it too has failed to provide its students the kind of transformational educational opportunity that would break cycles that reproduce social inequity and marginalized status (Seiler, 2002).

#### *1.2.6 Socio Historical Context of City High School*

City High school is located in the West Philadelphia community known as University City. This renewed urban landscape houses two universities, several medical institutions, a science center, an ever expanding number of redeveloped residential spaces and an array of small businesses that service the needs of the young upscale residents of the area. The majority of the students that feed into City High school do not however live within the confines of University City. They are predominantly African American children from the communities of Mantua, 'Da Bottom', and the Lancaster avenue sections to the north and northwest of University City. Unlike the newly developed residential areas within West Philadelphia, these communities are racially segregated (93-95% African American), poor (with 44% of household incomes below federal poverty level), and poorly educated (42-47% with no HS diploma: 8-16% with advanced educational degrees). Table 1.4 presents a comparison of the demography of these three West Philadelphia communities.

**Table 1.4 Demographic Data: The Black Bottom, Mantua, and University City: (2000)**

Demography	Community		
	Mantua	“Da” Bottom	University City
<b>Racial Composition</b>	92.8% Black	95.3% Black	30.9% Black
	3.3% White	1.5% White	48.2% White
	3.9% Other	3.2% Other	20.9% Asian
<b>Average Family Income</b>	13,367	17,310	28,750
<b>Percent Below Poverty Level</b>	44.1	44.3	16.8
<b>Percent of residents with College Education Advanced Degrees</b>	16.4	8.2	55.5
<b>Percent of residents with High School Education</b>	41.6	46.9	31.3
<b>Percent of residents with No High School diploma</b>	42.0	44.8	13.2

**Census Data: (US Census Bureau, 2010)**

Although City High was originally planned as the science and mathematics magnet school for children living in University City, the school’s planners were unable to convince the school board, and African American residents of the need to limit the school’s catchment area to the confines of the renewed cityscape (Oliff, 2000). After months of negotiations, the school’s proponents withdrew from the partnership with the school district and ceded control of the school to city officials. The loss of support from the local business community meant an end to the financial and political resources that would have permitted implementation of the progressive educational plans and specialized curriculum planned for the school (Salley, 1974).

In the conflicts that ensued, City High School became a reality, but the school that endured bore little resemblance to the one that the school’s planners originally conceived (Oliff, 2000, p. 8).

Within weeks of opening, the school had nearly filled to capacity (a total of 2000 students), as area schools were seriously overcrowded and in poor condition. Without adequate resources or curricular plans for such a large influx of children (with widely varying educational abilities), school officials were unable to create a curriculum that met the needs of such a diverse student body (Salley, 1974). Without a structured learning environment, students failed to engage in their learning and

culture from the surrounding communities engulfed the school. The architecture of the school (meant to facilitate collaborative learning and access to open learning spaces), provided bands of unsupervised students the freedom to roam the halls and engage in destructive violent behaviors (Oliff, 2000). Within months of the official opening, the school devolved into a dangerous, gang infested building where teachers and students were routinely assaulted (Thompson, 1972). The school improved considerably during the tenure of Principal Lytle (1995-1998), however it is not presently considered a school for families living in University City, rather, it is seen as the dysfunctional comprehensive high school that serves African American children from the marginalized communities of Mantua and “Da Bottom”.

### *1.2.7 Sociohistory of Mantua & “Da Bottom”*

To discover why inner city schools have not improved it is not enough to only examine present day reform or educational practice. We need to understand how inner city schools have come to be what they are. For schools like people are products of their past as well as of their present. We must uncover not only the histories of schools and districts but also of those of the cities in which they are embedded (Anyon, 1997, p. xv)

The communities of Mantua and “Da Bottom”<sup>10</sup> were predominantly white working class neighborhoods from the late 19th century until the mid 1940s. Not until the years following the Second World War did the area take on its distinctly African American demography as the second ‘great migration’ brought millions of southern blacks to northern industrial centers in search of work (Hamilton, 1964). Newly arriving black migrants would find little work in Philadelphia of the late 1940s as the forces of deindustrialization had already started to reduce the availability of blue-collar jobs (Licht & Scranton, 1968). African Americans would remain jobless as racial discrimination limited entrance into unions, trade guilds, and apprenticeship programs which effectively blocked access to the diminishing industrial labor markets (Licht, 1992). Racial segregation in the city limited the new arrivals to housing in areas where blacks already lived, thus the population in the city’s black communities increased dramatically. It was during the years of 1944 to 1960 that the racial makeup of West Philadelphia changed from 19% African American in 1940 to

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<sup>10</sup> Da Bottom is not an officially recognized community, however it was so named by area residents to designate neighborhoods in the northwest sections of Mantua (census tract 108). A map of the census tracts (107-109) corresponding to the school’s feeder pattern is located in Appendix A-1.

28% in 1950: by 1960, African Americans would become the dominant racial group (52%) in West Philadelphia (Lloyd, 2008). The increased population density, unemployment, and resulting lack of economic resources led to decaying residential properties, poverty, and crime within the growing black enclaves of West Philadelphia (Jones, 2004). The encroaching residential blight prompted local universities and civic leaders to form the West Philadelphia Corporation, which proposed the building of a modern research and educational community. Corporation officials hoped that a large-scale urban renewal effort would stave off further residential deterioration (Carlson, 1999) and prevent West Philadelphia from becoming “a sea of residential slums with commercial and institutional islands” (Hughes, 1977, p.6). The construction of the University City Science Center and City High school occasioned the destruction of approximately 120 acres of land within the geographical center of the black community (O'Mara, 2005). Although displaced residents were offered new homes, many of the more socially mobile chose to leave the area, leaving the poorer residents to live in a much smaller swath of land to the north of the school.

In the ensuing years, both Mantua and Da Bottom, have continued their economic deterioration (Garofalo, 2008), as the redevelopment efforts focused solely on the aesthetics of the new buildings and streetscapes and failed to address any of the underlying causes of poverty and residential blight (O'Mara, 2005). Thus as one enters University City one is struck by the many gleaming constructions of the ever expanding cityscape, however, to the north of the new edifices, one finds the segregated, geographically isolated black communities where poverty continues to concentrate and the urban poor fade away into the background of the renewed landscape.

### *1.2.8 Historical Sociocultural Perspectives*

This brief history of City High school and its surrounding communities illustrates the manner in which cycles of capital disinvestment and urban social policy intersect with legacies of discriminatory racial practices to create the marginalized, impoverished conditions that characterize inner city urban environments (Wilson, 2007). Awareness of the historical trajectory of these conditions is (as noted earlier)

vital to our efforts to honor | respect difference because these conditions structure the culture that evolves in the neighborhoods in which our students live and grow.

Cultural enactment in the social spaces (fields) outside the classroom is of importance to the urban educator because the boundaries of all cultural fields are porous (Schwartz, 1997) and culture enacted in our students' lifeworlds can easily cross over into that of the science classroom. This is not to imply that our students' cultural production is necessarily disruptive or inappropriate, however our experiences have shown that failure to consider the culture that informs student dispositions and social practices can occasion disrespectful interactions (on the part of students or teachers) that destabilize our best efforts to create transformative learning environments.

The significance of culture in the teaching | learning of science emerges from research collaborations with teachers in City High, (the first two research efforts in the history of the DUS<sup>11</sup>), which attempted to provide transformative learning opportunity to students in low performing learning communities in our school (Tobin, Seiler, & Walls, 1999) and (Seiler, Tobin, & Sokolic, 2001). Both efforts proved unsuccessful as student resistance, opposition, and rejection of the teachers' efforts to forge supportive relationships, thwarted attempts to engage them in inquiry based collaborative learning activities. The researchers might have framed student behavior within a deficit perspective, but chose not to, as close analysis of classroom interactions revealed that student practices were not necessarily oppositional; but rather the enactment of culture informed by codes emanating from their lifeworlds. Researchers concluded that in order to build transformative learning environment teachers needed to "take into account the historical and social environments in which the students live and attend school" (Seiler, Tobin, & Sokolic, 2001, p. 761), because the teaching | learning of science,

like all human activity depends on the socially shared habits, practices and resources that individuals mobilize because he or she is a member of a community with a history and a system of basic values (Lemke, 1990, p. 45) cited in (Seiler, Tobin, & Sokolic, 2001, p. 761)

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<sup>11</sup> The literature of the Discovering Urban Science Research group is detailed in chapter 4.

Thus, our cultural, social, historical perspective suggests that social practice is informed by our life narratives and structured by schema, which reflects our historical association in given communities of practice. Schema and associated social practices constitute (as detailed in the following section) the culture of a community. As we engage in social activity, we produce, reproduce, or transform the culture of the communities in which we live and grow. It is within this sociocultural perspective that we conceptualize the teaching | learning of science (and all social practice), as forms of cultural production (Lemke, 2001).

Historical sociocultural perspectives are appropriate to our work in urban schools because they provide insights into the macroscopic forces that configure our students' lifeworlds and provide theoretical frameworks that help structure rigorous, intellectually challenging learning environments that maximize potential. Creating such learning environments is not an easy task, given the academic, fiscal, and systemic challenges that we face within urban schools, however my experiences suggest that framing our efforts within a cultural sociological perspective provides the best framework within which to conceptualize the responses to these challenges.

### **1. 3 CULTURAL SOCIOLOGICAL PERSPECTIVES**

#### *1.3.1 Culture, Structure, and Agency*

The cultural sociology, which frames this thesis, theorizes culture as the dialectical interrelationship between schema (a semiotic system of signs, symbols and rules) and related social practices (Sewell, 1999). Culture is enacted when members of given social groups access relevant schema and engage in practices that define meaningful goal oriented activity within their communities of practice (Lemke, 2001). Our lives within these communities provide the “languages, pictorial conventions, belief systems, value systems, specialized discourses, and practices” that we use “for making sense of and to those around us” (p. 296).

Collectively such tools for living - our social semiotic resource systems and our socially meaningful ways of using them constitute the culture of a community (ibid).

The culture of a community results from the history of interactions and social practices that bind members together as they engage in activity that furthers their life

goals and aspirations (Lemke, 1995). The power to act and pursue one's life goals: (agency), is dialectically interconnected with the structures (human, symbolic, material) resources that (constrain or enable) activity within the social fields we inhabit (Seiler, 2002). Access to human and material resources (child and health care, adequate nutrition, educational opportunity, housing, gainful employment) is essential to our ability to control and direct significant life events, while symbolic resources (supportive social networks, sociopolitical status) determine the nature of affiliations with mainstream cultural institutions (Wacquant & Wilson, 1989). Economic conditions are therefore powerful structural determinants of the culture that evolves in the urban environment because these realities can severely limit access to requisite material and symbolic resources and in so doing constrain the agency of urban residents. It is discomfoting to note that the historical narrative of African Americans in our nation's inner cities is one in which economic oppression, segregation, and sociopolitical marginalization have systematically denied the urban poor access to the most basic resources (Wacquant, 2002).

The culture that evolves within impoverished, segregated, urban environments is therefore a response to a history of sociocultural and economic constraints (Wilson, 1987), and "reflects a profound alienation from mainstream cultural themes" (Anderson, 1999, p. 35). As a result, the cultural perspectives that inform and guide life within inner city communities, while viable in the lifeworlds of urban residents (our students and their parents), differ in many respects from the dominant cultural themes that structure educational institutions (Rothstein, 2004), the life narratives of the teachers within those institutions (Nieto, 2002), and the culture of the scientific community (Brown, 2004). These varying cultures converge in the urban classroom and populate the field with boundaries of difference, which in many instances become sites of conflict and tension as students and teachers attempt to communicate across radically different cultural perspectives,

[When] teachers and students are from different race and class backgrounds there is a potential difficulty for each to make sense of the other's practices and intentions. Opportunities arise for misunderstandings of cultural practices and interactions to be regarded as disrespectful (Tobin, 2006, p.1).

Attention to communication across boundaries of difference is increasingly critical to successful teaching in the urban setting as accelerating patterns of immigration bring new cultures into urban neighborhoods (Pitts, 2007), which subsequently expand the array of difference in our classrooms. Additional variations across age, social status, and gender complicate the range of variability thus increasing the potential for cultural misalignment.

### *1.3.2 Cultural Variation in the Urban Science Classroom*

Cultural misalignment is (in my estimation) the major challenge in the urban setting as it can occasion exclusionary practices by teachers unable to recognize the inherent value in the social and cultural capital emanating from students' lifeworlds (Elmesky, 2005). Similarly, students may interpret differences in styles of communication, modes of interpersonal interaction, or perceived social class as reasons to position the teacher as a cultural other, who cannot be trusted and should be actively disrespected and challenged (Tobin, Seiler, & Walls, 1999). In these circumstances boundaries of difference harden into irreconcilable cultural borders as teachers and students, unable to honor or respect the difference their unique life narratives represent, retreat from sites of communication | negotiation and remain isolated within predefined categorical identifications. The resulting symbolic violence (Bourdieu, 1992) creates an atmosphere of suspicion, disrespect and fractious social interactions which fuel cycles of oppositional student culture, resistance and the reproduction of marginalized social status (Willis, 1977).

### *1.3.3 A Note on the Fallacy of Cultural Homogeneity*

Although it is true that residents of urban communities have experienced difficult histories of economic and sociopolitical oppression, it is important to note that there is considerable variability in the way individual families react to these realities and in the cultural codes, they adopt to socialize their children. Anderson (1999) notes that while "Almost everyone residing in poor inner city neighborhoods is struggling financially and therefore feels a certain distance from the rest of America, there are degrees of alienation [that] represent two poles of value orientation" (p. 35). While some families adopt culture that reflects "the profound sense of alienation from mainstream society and its institutions" (p. 34), other families "accept mainstream values and attempt to instill them in their children" (p. 38). Sewell (1999) notes that

all culture is contested and weakly bound with coherences and associated contradictions. Thus, we should not assume that all inner city residents have adopted the same set of cultural adaptation based on common categorical identifications or a shared socioeconomic history.

My interpretations of the literature on African American anthropology (Boykin, 1986), initially led me to assume that a unique set of teaching practices would benefit the cultural perspectives of all my students. While these teaching practices proved somewhat successful in the short term, they inadvertently marginalized students who required a more nuanced understanding of their cultural dispositions and learning needs (Scantlebury, 2005a). The assumption that all students from a given social group would exhibit similar cultural dispositions (and therefore benefit from a specific style of social interaction) fails to fully account for the range of variation in urban classroom. Such assumption occasion circumstances in which some students experience symbolic violence or shutdowns because teachers mistakenly assume that a given set of teaching practices would necessarily be appropriate for all students from a given cultural field (Tobin, 2006).

Home Bhabha (1988) proposes a critique of political values that “ascribe unity or totality to cultures “especially those that have known long and tyrannical histories of domination and misrecognition” (p. 20). Echoing Sewell, he reminds us that “all cultural statements and systems are constructed in [a] contradictory and ambivalent space [that renders] the ‘purity of cultures untenable” (p. 21). Thus while it is important to acknowledge the role that historical processes of socioeconomic exploitation and racism have played in the lives of urban youth, it is vital to understand that we are *all* configured by our historical narratives and, (most importantly), that *all participants* in the classroom field are complicit (although in different ways) in maintaining a communicative barrier (Gutierrez, Rymes, & Larson, 1995). It is my belief, that the work of the critical educator centers on the creation of new more equitable power relationships that allow teachers and students to honestly communicate | negotiate across difference.

Communication | negotiation are presented as dialectically related because genuine communication across difference demands a willingness to reevaluate our cultural

assumptions (about ourselves, our students, the structures within our classrooms) and a commitment to modify those beliefs, cultural perspectives, and classroom structures in order to maximize the learning potential of our students. Given that teachers in the urban setting are likely to embody dominant cultural perspectives that differ from those of their students, a commitment to genuine communication | negotiation across difference requires that we address (and eliminate) existing power relations that privilege the teacher's voice over those of other participants in the learning environment. Eliminating such power inequities is necessary because they help maintain the communicative barriers that so often destabilize social interactions in our classrooms. While it is our differing life narratives that occasion the cultural variability in the classroom field, it is our unwillingness to cede power to our students that perpetuates the cultural misalignments that problematize teaching | learning in the urban setting. A willingness to negotiate and change existing structures presupposes and constitutes communication because there can be no mutual understanding of differing cultural perspectives if the teacher's voice retains its historically privileged position.

#### *1.3.4 Communication | Negotiation across Difference*

Research undertaken in urban schools in Philadelphia and New York City has shown that social interactions that allow teachers and students to become familiar with and understand the "Other's" cultural perspectives provide the "seedbeds for learning environments characterized by mutual respect, solidarity, and a shared commitment to learning" (Pitts, 2007, p. 235). The creation of such environments depends on our ability to forge new cultural relations that help us to respectfully communicate across differences and negotiate solutions to the contradictions within the classroom.

My first months in City High were particularly disorienting as I assumed that I knew how to teach and interact with the students in my new school. My identity as an urban teacher was informed by a historical biography (Archer, 2003) that had served me well in other urban teaching environments. This identity would however, prove ineffective in my new reality. In time I would learn that my identity was not sufficiently "fluid" to explore new conceptualizations of what it meant to teach in this urban environment: thus I was not able to successfully communicate across the cultural difference that existed between me and my students. Not until several

months of strident, unnerving encounters did I move (along with my students) into a different social space where as (Bhabha, 1994) notes we were able

think beyond narratives of originary and initial subjectivities and move into the ‘in between’ spaces...that initiate new signs of identity, and innovative sites of collaboration and contestation (p. 1)

The space theorized by Bhabha represents an interstice: a social space existing between the categorical identifications of (race, class, gender, ethnicity) that separate and polarize us one from the other. As noted earlier, the urban science classroom is populated with many boundaries of difference that can easily become hardened cultural borders fraught with contestation and tension. Interactions across rigid cultural borders, do little to “help teachers [or students] shift their perceptions of Others, or acknowledge their difficulties” rather, they “reinforce binary conceptualizations that limit the exploration of the “in-between, that is difference and identity as fluid, plural, situated, provisional, and hybrid” (Carter, 2004 p. 832). Once this occurs the science classroom fills with negative emotional energies, which destabilize solidarity, and engender symbolically violent negative encounters. Movement into the interstitial space is therefore essential to our efforts to establish communication | negotiation across boundaries of difference as it within the interstitial field, that teachers and students are able to configure hybrid cultural identities that allow each to more fully understand and respect the Other (Pitts, 2007).

### *1.3.5 Maintaining the Permeability of Boundaries of Difference*

Maintaining the permeability of cultural boundaries is therefore crucial to efforts to promote communication | negotiation across difference because the articulation of new cultural relations cannot occur in a social field wherein teacher and student are separated by rigid cultural borders (Carter, 2004). Moreover, the failure to foster new cultural relations legitimizes historical power inequities between dominant and minority cultures, thus tacitly condoning the continued hegemony of mainstream cultural themes (Nieto, 2002). Of concern to the critical science educator are the ways in which traditional representations of the canons of Western science contribute to the hegemonic discourses (Fairclough, 2007), which reinforce borders between the scientific community and the cultures of minority populations (Carter,

2004). These epistemic borders restrict the ways in which students from marginalized populations can deploy their cultural resources (Elmesky, 2005) thus limiting their ability to maximize their learning potential. Science education that fails to respond to the cultural capital of urban students reinforces discursive borders (Barton, 1998), which have traditionally limited the transformative potential of science education in the urban setting (Barton, 2001).

### *1.3.6 Communication / Negotiation in the Interstitial Space*

Kwame Appiah (2006) promotes conversation across boundaries of identity as an “imaginative engagement with the experience and ideas of others”: an encounter with “a reality that “speaks from some place other than your own” (p. 85). Conversation he suggests is the medium through which we can “get used to one another” so as to more fully understand and value the varied life narratives that intersect in our ever-expanding global community.

The importance of conversation as a meditational tool in the urban classroom cannot be overstated. At pivotal moments in my history at City High, frank, open conversations with students have helped defuse tension filled moments of confrontation. My first attempt to genuinely communicate with my students (and honestly negotiate solutions to contradictions in our classroom), produced the initial movement towards a more complete understanding of each other’s perspectives and motivations. Given the success of our first talk, I continued to engage my students in conversation to address problems in our learning environment.

In the fall of 2001, a research effort led by W-Michael Roth would use conversations as research methodology to analyze the formation of cultural identity within the science classroom. The paper, *Re-Making Identities in the Praxis of Urban Schooling - A Cultural Historical Approach*, (Roth W.-M., Tobin, Elmesky, Carambo, McKnight, & Beers, 2002) introduced cogenerative dialogues as a resource to help “differently located participants in the same situation arrive at structural explanations for their different understandings” (p.36). The dialogues proved invaluable as they provided my students and me, a forum in which we could freely articulate our perspectives and resolve our dispute. Since that time, cogenerative dialogues have remained as a central component of our efforts to create

transformative learning environments (Bayne, 2009), as they help structure equitable conversations between *all participants* in the science classroom (La Van, 2005).

### *1.3.7 Cogenerative Dialogues*

Cogenerative dialogues are open, honest conversations between teachers and students that allow each to more fully understand each other's cultural perspectives and create common solutions to contradictions existing in the classroom field (Martin, 2005). Structured to contest inequity, power differentials, and official hierarchies the dialogues create,

a physical and temporal place where individuals interact with each other in order to co-create new culture and / or amend that culture in order to improve the quality and efficacy of teaching and learning (Bayne, 2009 p. 515).

The co-construction of shared goals and perspectives enables the creation | recreation of identities (Roth, et al, 2002), and the configuration of new cultural relations that are foundational to learning environments characterized by mutual respect, solidarity and a shared commitment to learning (Pitts, 2007). Interactions within these transformed interstitial spaces engender positive emotional energies that approbate students' emerging science identities and foster solidarity with the culture of the school science community (Olitsky, 2007). The exemplary science learning documented in this thesis is the result of the ongoing communication | negotiation across flexible boundaries of difference facilitated by our cogenerative dialogues.

Cogenerative dialogues with our students helped create interstitial spaces wherein we were able to forge new cultural relationships free of the historical power asymmetries existing between students and teachers. It is within these transformed spaces that our students have been able to deploy their cultural resources to learn science in ways that were personally meaningful, transformative and educative. This thesis opens with the story of Matthew and his electric motor as an example of the exemplary learning that occurs within these transformative interstitial spaces.

### *1.3.8 Facing the Challenges*

This opening chapter has served to introduce the major theoretical themes that inform my analysis of the challenges facing science educators in the urban setting. I have framed my analysis within cultural sociological perspectives because I feel that

educators must fully understand the social, cultural, and historical dimensions that structure our students' lifeworlds. Such understandings provide the awareness and sensitivity needed to genuinely honor | respect difference and in so doing co-construct mutual respect and trust.

Although I understand the complex nature of teaching in the urban setting, I have selected respect for cultural difference as the most important component of my praxis because of the inherent power differential that separates me and my students and the potential that exists to inadvertently marginalize or disprivilege them as a result of their cultural difference (Tobin, 2006). Although I am of the same race and class background as most of my students, my life narrative, and social status position me as a member of the dominant sociocultural groups in our society. As noted earlier, it is our history within our various communities of practice that provide each of us the cultural resources we use to guide and inform our social interactions. Thus although similar in some respects, I am finally culturally different from the majority of my students.

Honoring and respecting the cultural difference in my classroom means that I must remain aware of the many ways in which my perspectives represent dominant cultural themes and (more importantly), that the culture emanating from my students' lifeworld is as valued and viable as my perspectives on any given situation. My responsibility as critical educator is to acknowledge the cultural variability in my classroom and then to structure a learning environment "that entertains [that] difference without an assumed or imposed hierarchy" (Bhabha, 1994, p. 45).

The story of Matthew and his electric motor is a vision of the kind of exemplary science learning that I wish to create for all of my students. However, the realities of their lifeworlds, the school's fiscal constraints, and the sociocultural-political marginalization of the urban poor pose formidable challenges to that vision. My experiences within the school, and my work with members of the DUS, suggest that there is no single approach to the many issues that problematize teaching | learning in urban neighborhoods. Our collaborative research in a variety of Philadelphia schools over a five-year period has produced an array of responses to these

challenges that together create an ecology capable of providing students like Matthew the educational opportunity they so richly deserve.

#### **1. 4 OVERVIEW OF THESIS**

The opening of this thesis juxtaposes Matthew's exemplary scientific fluency with his history of academic underperformance to highlight the reality that he (and countless other highly intelligent students) are not receiving an education that maximizes their learning potential. The exemplary science learning documented in this thesis and in the work of the DUS evidence their potential when the proper resources are made available. Thus, the central question this thesis seeks to answer is how to structure learning environments capable of providing transformative educational opportunity that maximizes the learning potential of youth from traditionally marginalized urban populations.

Our efforts to create such transformative learning environments are complicated by the many boundaries of difference that converge in the urban science classroom. The variation in life narratives and cultural perspectives can lead to misunderstandings and instances of symbolic violence, and disrespectful interactions. Such contradictions in the learning environment occasion the intrusion of resistant oppositional culture from fields outside the classroom, disengagement, and shutdowns of student culture as teachers attempt to coerce cooperation and engagement. Thus, our attempts to maximize the learning potential of urban youth must first determine how to avoid cultural incongruities and (more importantly) how to resolve contradictions in the classroom in ways that engender trust and mutual respect. A second question this thesis seeks to answer is how to co-construct the kinds of cultural relations that allow for respectful communication | negotiation across boundaries of difference.

Our work with the sociology of emotions complements our earlier cultural sociology as it suggests that attention to the emotional climate within the classroom impacts solidarity and the formation of successful science identity. Understanding the role that emotions play in creating solidarity with the school science community: thus, a third orienting question is how to address emotions and emotional energy in the classroom and how this affects identity formation.

This thesis explores these questions through a series of ethnographic accounts, narratives, interviews, and two published manuscripts, describing my interactions with students in two small learning communities during my first three years of teaching in City High School. The events chronicled in this writing describe my efforts to create transformative learning environments that maximize the learning potential of youth from traditionally marginalized populations.

#### *1.4.1 Guiding Questions*

1. How do we create learning environments that maximize the learning potential of youth from traditionally marginalized populations?

- Understanding that urban youth possess vast stores of capital, how do we structure learning environments that encourage them to deploy their cultural, social, and symbolic capital in the learning of science?
- What are the requisite structures (human, material, symbolic resources) that enable student agency?

2. How do I foster communication| negotiation across difference in ways that help co-construct respect and mutual trust?

- What are the structural components of a learning environment that facilitate communication across difference?
- How do I recognize instances in which I marginalize or disrespect students?
- How do I address and resolve social interactions that disprivilege or marginalize student?

3. Understanding the role that emotions play in creating solidarity with the school science community:

- How do I engage my students in ways that respect their cultural perspectives and engender positive emotions in the classroom?
- What are the requisite structural components of a learning environment that helps students create the successful science identities that build solidarity within the school science community?
- How do I recognize circumstances in which my actions foster negative emotions and (more importantly) how do I resolve such

circumstances in ways that build mutual respect and engender positive emotional energy

#### *1.4.2 Method / Data Sources*

Journal entries, field notes, and personal narratives were the principal sources of data for the first year of the fall 2000 through spring of 2001. Commencing in the fall of 2001, videotape footage of my chemistry classes provides the principal source of data for analysis. Within each of my chemistry classrooms, research associates from the DUS videotaped and catalogued classroom interactions for our ongoing research. Videotape was analyzed using the frame-by-frame method in order to determine activity at the micro level of analysis. Additionally, student interviews and conversations were audio taped and transcribed for research purposes. Transcribed interviews were member checked for accuracy and correct interpretation of events. Tapes were archived and duplicated for the research efforts of visiting researchers and teacher researchers within the DUS.

#### *1.4.3 Research Literature as Data Source*

Archives of classroom interactions also served as data sources for research papers that explored salient issues within my science classroom. Three of these research papers provide data for the writing of this thesis as they document my voice as well as the perspectives of students, fellow researchers, and administrators at pivotal moments in the development of our learning community. The paper *Remaking Identities in the Praxis of Urban Schooling: A Cultural Historical Perspective*, (Roth W. -M., Tobin, Elmesky, Carambo, McKnight, & Beers, 2002) is particularly salient as it analyzed the contradictions that arise as students and teachers attempt to forge new cultural identities. Written in the fall of 2001, the work helped me to fully understand the importance of identity, emotions, and cogenerative dialogues as requisite structures within my classroom. Included, as additional data sources are excerpts from my work on the use of student interests in the creation of curriculum: *Learning Science and the Centrality of Student Participation* (Carambo, 2005). Based on research undertaken in my chemistry and biology classes, this paper expanded on our use of cogenerative dialogues to create a curriculum informed by student interest. The paper chronicles the increasingly positive emotional energy in our learning community as we provided a vast assortment of structural resources that

increased student agency. The papers, *Gender Equity in Urban Schools* (Scantlebury, 2005) and *Aligning the Cultures of Teaching and Learning in Urban Schools* (Tobin, 2006), are also included as they provide evidence of teaching practices that marginalized students within my classroom. Given the seemingly successful nature of our learning community, I failed to see these hidden contradictions in my praxis and as a result, many failed to maximize their learning potential. The critical research by these authors identified the contradictions in my teaching practice thus allowing me to continue my growth as science educator. Additional research papers written by members of the DUS are referenced throughout this thesis as they chronicle the evolution of the theoretical perspectives that framed my development as urban educator.

#### *1.4.4 Critical Perspectives and Transformative Praxis*

The underlying rationale for this thesis is to understand how to structure learning environments that maximize the learning potential of youth from traditionally marginalized urban population. The historical narrative of the schools within poor inner city communities has documented the role that these institutions play in maintaining and preserving inequality in our society. This thesis is therefore written from a critical perspective that seeks to understand the social, historical, and cultural structures that (enable, or constrain) the agency of marginalized urban student populations. It is my belief that institutions (and teachers) that fail to provide urban youth the resources needed to break historical cycles of sociopolitical oppression are complicit in the reproduction of socioeconomic inequality and marginalized social status. Thus, this thesis documents my efforts to break those cycles and create learning environments that maximize the learning potential of youth from the urban communities of West Philadelphia.

My efforts to teach in this community were not immediately successful as I was positioned as a cultural “other” and actively rejected by my students. These relations improved (gradually over time) and I was finally accepted as a viable teacher within the City High School community. The chapters herein chronicle the history of my successful transformation as an urban educator and (more importantly) how my understandings enabled the creation of learning environments that helped students

(with long histories of academic underperformance) learn science in ways that were personally relevant, meaningful, and transformative in their lives.

This thesis is written from the perspective of a critical teacher-researcher and is meant to provide generalizable knowledge to other practitioners wishing to enact transformative practice in their classrooms. Each chapter therefore represents a different aspect of the social, cultural, and historical dimensions of teaching | learning that are relevant to the ongoing evolution of the critical educator and the transformation of the learning environment.

The authenticity criteria (Guba & Lincoln, 1989), demand that research be educative for all of the participants in a given social field, thus each chapter ends with a summary of what was learned (ontological and educative authenticity), during a given year and how the emerging understandings provide relevant stakeholders resources that enable the continuing transformation of the learning environment (tactical and catalytic authenticity). These understandings are summarized in the final chapter of this thesis.

## **1.5 ORGANIZATION OF CHAPTERS**

The chapters in this thesis span the first three years (2000 – 2003) of my practice as a science teacher in City High School. During this time, my perspectives on teaching and learning of science underwent considerable change as a result of events in my school community and ongoing collaborative research with fellow educators in the DUS group. As a member of the DUS, I grew to understand the salience of the cultural, social and historical dimensions in the teaching | learning of science in the urban setting. The ongoing recursive relationship between theory and practice allowed me to gradually incorporate these perspectives into my evolving praxis. As a result, each chapter of this thesis incorporates a different aspect of our emerging cultural sociological perspectives on teaching and learning of science.

### *1.5.1 Chapter One: The Promise and Challenges of Teaching in the Urban Setting*

This opening chapter describes the challenges in the urban setting and suggests social, cultural, and historical perspectives as alternatives to the deficit theories that currently inform our national education policy. Social historical perspectives provide

insights into the macroscopic forces that structure culture in the communities of West Philadelphia. Such awareness is essential as it helps us to more fully understand the cultural codes that inform our students' social practices and facilitates the communication | negotiation across difference that is foundational to learning communities that engender trust, mutual respect and shared commitment to learning. These learning environments provide students the interstitial cultural resources that help them build successful science identities and create solidarity with the culture of the school science community. The story of Matthew and his Electric Motor opens this chapter as example of the kind of exemplary science learning occurring within these transformative interstitial spaces.

### *1.5.2 Chapter Two: Historical Perspectives on Social and Political Development of West Philadelphia Neighborhoods*

Our efforts to create transformative learning environments begin with our understanding of the macroscopic forces that structure life in the neighborhoods that contextualize City High school. Awareness of the structures that inform cultural enactment in the fields outside of the classroom is vital given that the boundaries of fields are porous and culture from one field is often enacted in another. Knowledge of the historical development of the culture of inner city neighborhoods sensitizes educators to their students' life narratives and facilitates the cultural alignment that is foundational to the successful social encounters that engender positive emotional energy and solidarity. Chapter two chronicles the development of West Philadelphia neighborhoods within the sociopolitical history of Philadelphia and seeks to explore how migration trends, cycles of industrial growth, economic decline, and urban renewal policies converged to structure social life in the communities surrounding City High school. This chapter includes a history of the development of the University City urban landscape and the construction of City High School as these events have had a profound influence on the quality of teaching and learning within the school.

### *1.5.3 Chapter Three: Foundations of a Transformative Learning Environment*

Chapter three of this thesis documents my first year as teacher in the SET (Science Education and Technology) small learning community. Although I had a history as urban educator, I was not prepared for the reality that my students would construct

me as a cultural other and openly reject my attempts to become a member of their community. My first months in the school were characterized by a series of contentious confrontations with students who resisted and opposed my attempts to be their science teacher. Encounters with researchers from a local university introduced me to literature that provided insights on the nature of student resistant and oppositional culture.

Subsequent to my readings on resistance theory, I was exposed to the literature of African American anthropologists that further elaborated the cultural implications of the difficulties I was experiencing. The readings provided me new insights on my students' (and my own) cultural perspectives and (more importantly) how to interact with them in ways that lessened occasions of symbolic violence. These events occurred during my first semester in City High School during the fall of 2001

The addition of a variety of human and material resources during the first months of 2001 provided needed material resources that helped restructure the learning environment. Most important of these resources was the addition of student coteachers, and university-researchers to our learning community. The presence of the additional human resources helped create a social space within which I could build trusting relationships with my students and in doing bridge the cultural divide that initially separated us. The influx of a large assortment of material resources helped create a challenging curriculum that engaged students in challenging, inquiry based science learning (Carambo, 2005).

#### *1.5.4 Chapter Four: The Discovering Urban Science Research Group: Evolution of an Urban Research Program*

Chapter four of this thesis is a published manuscript documenting the literature of the Discovering Urban Science research group. The collaborative research efforts of this group of teachers, university researchers, and graduate students provided the theoretical perspectives that informed and guided my development as urban educator. I have used the chronology of these works to structure the writing of this thesis as the emerging body of theoretical understandings provided critical insights

at pivotal junctures in the evolution of my praxis: thus of the works by my colleagues guide and inform a specific chapter of this thesis.

Two early research papers: *Reproduction of Social Class in the Teaching and Learning of Science in Urban High Schools* (Tobin, Seiler, & Walls, 1999) and *Design, Technology and Science: Sites for Learning, Resistance and Social Reproduction in Urban Schools* (Seiler, Tobin, & Sokolic, 2001), introduced me to resistance theory and the writings of African American anthropologists. These readings provided insights that helped me understand the nature of the cultural divide that problematized my first months in school. These works inform chapter three of this thesis: “Foundations of a Transformative Learning Environment.” The research paper *Remaking Identities in the Praxis of Urban Schooling: A Cultural Historical Perspective* by (Roth, Tobin, Elmesky, Carambo, McKnight, & Beers, 2002), introduced Cultural Historical Activity Theory as a means to explore identity formation and analyze contradictions within the classroom field. This work introduced the cogenerative dialogue as a meditational tool to resolve conflicts between participants and informs the first half of the chapter five of this thesis: “Transformation of a Science Learning Community.” Martin’s (2005) thesis, *The Cultural and Social Dimensions of Successful Teaching and Learning in an Urban Science Classroom*, and Olitsky’s (2004) dissertation, *Science Learning, Group Membership and Identity in an Urban Science Classroom*, introduced the sociology of emotions as methodology to explore group solidarity and identity formation in the urban classrooms. The sociology of emotions would complement existing sociocultural perspectives and remain as a guiding theoretic to my ongoing understanding of teaching | learning in the urban setting. The two frameworks serve to structure the latter half of chapter five and chapter six of this thesis.

#### *1.5.5 Chapter Five: Transformation of a Learning Community*

This chapter documents my ongoing enculturation and the continued transformation of our small learning community. Building on the structural changes that were instituted during the spring of 2001, our teaching staff implemented a variety of new resources meant to improve teaching | learning in our small learning community. Central to this effort was our “ninth grade initiative” and the introduction of eight co teachers into our community. As a member of the DUS, I and other researchers

began research studies throughout our school. Thus, additional co-researchers became part of my science classroom. The start of the year was different from the previous year as I was now a respected member of the school community. Serious infractions were few, as the majority of my students respected me. Although I had created what seemed to be a successful cultural identity, events during the first weeks of October occasioned a serious dispute with a student in my environmental science class. The event became the focus of the research by (Roth, Tobin, Elmesky, Carambo, McKnight, & Beers, 2002), which explored the formation of identity in the urban classroom. This chapter presents an analysis of the cause of the dispute and its resolution using cogenerative dialogues as a method to solicit the perspectives of participants in the science classroom. A second dispute in the fall of 2001, examines the role that emotions and emotional energy play in the creation of solidarity with the school science community. The sociology of emotions structures my analysis of the dispute and remains as guiding theoretic throughout the remaining chapters of this thesis. Chapter five concludes with the published manuscript, *The Centrality of Student Participation* (Carambo, 2005) which documents the use of cogenerative dialogues as a way to incorporate student interest in the creation of science activities. The paper details the May Projects, which explored student interests in physics (the science of amusement park rides), biology (dissection and gel electrophoresis), and chemistry (wet cells and the lemon battery). A detailed analysis of one student at work on a dissection: 'Jarvis and the Dissection of the Frog Heart' is included as evidence of the exemplary learning that occurs when student interests guide the enacted curriculum.

#### *1.5.6 Chapter Six: Confessions of a Successful Urban Educator*

The successful transformation of various components of the SET learning community occasioned my transfer (along with several other teachers and our coordinator) to the magnet-motivation learning community in our school. Although I was now considered a successful educator in this school, analysis of my interaction with students in my chemistry class suggested that not all of my students were served well by my teaching style. Analysis of videotapes of my classroom revealed that my interactional style (while appropriate for some students) created a negative emotional climate that marginalized many students. Videotaped footage of these

students in alternative learning environments (the May Projects, the Labs at Penn, and with researchers in the DUS) suggested that the interstitial cultural resources within those environments fostered successful social interactions that engendered positive emotional energy that helped them construct successful science identities. The confessional tale within this chapter documents my realization of the erroneous assumption that a given interactional style was appropriate for all my students (and more problematic) that my increasing social capital as “successful urban educator” obscured the inherent contradiction in my praxis. Included in this chapter is an interview with Elmesky who worked extensively with several students that were marginalized in my chemistry class. Her perspectives on my teaching style provide valuable insights on how to structure learning environments that address the learning needs of these marginalized students.

Matthew was chosen as a focus of this chapter because he was unsuccessful in my chemistry class. His academic performance, attendance, and level of engagement suggest that my teaching style failed to offer him the resources needed to experience positive emotional energy and build solidarity with the school science community. Such was not the case during his exploration of the science of magnets. The story of his electric motor project is included in this chapter as evidence of the exemplary learning that occurs when students are provided the structures that help them engage in positive social interactions that help them construct successful science identities.

#### *1.5.7 Lessons Learned*

Chapter seven summarizes what was learned during my three years of practice in City High School and during the writing of this thesis. It details the lessons learned and proposes how these insights can structure the ongoing transformation of teaching | learning in the urban setting. The chapter includes a brief narrative of my history after City High School. Although I carried my knowledge and perspectives as critical educator with me, I was unable to create a learning environment that would maximize the potential of my new students. The unfortunate reality is that current educational policy is hegemonic and restrictive of teacher agency. The national fixation on standardized achievement has intensified deficit perspectives demand a “one size fits all” approach to all aspects of the enacted curriculum. These policies are disproportionately enforced in schools that service the urban poor. It is a

reality that perpetuates historical cycles of socioeconomic and political marginalization. It is especially troubling as the evolution of transformative praxis demands that educators have the resources to analyze and resolve contradictions that are germane to their learning environment. In this manner, schools can respond to the unique learning needs of their students. Without this flexibility, urban institutions will continue to reproduce the educational inequality that current policies are attempting to correct.

I begin this thesis with an exploration of the social history of the communities of West Philadelphia, for, as stated earlier, our knowledge of the social history of the communities that contextualize our schools, sensitizes us to the cultural perspectives that inform our students' social practices. It is this sensitivity that facilitates the communication | negotiation across difference that is foundational to learning environments that maximize our student's learning potential.

Chapter two explores the history of West Philadelphia's black community as background to creation of University City and the construction of City High school. These histories are relevant to our analysis of teaching | learning in this school because "school like people are products of their past" (Anyon, 1997, p. xv). Thus to fully understand the nature of urban schools we need to "uncover not only the history of the schools," but also that "of the cities in which they are embedded (ibid).

CHAPTER TWO  
HISTORICAL PERSPECTIVES ON THE SOCIAL AND  
POLITICAL DEVELOPMENT OF WEST PHILADELPHIA  
NEIGHBORHOODS

**2.1 URBAN SOCIAL POLICY IN WEST PHILADELPHIA 1950-1970**

*2.1.1 A Diminished Community*

City High school is located near the southernmost boundary of the West Philadelphia community known locally as the ‘Da Bottom’. Although the physical space the school occupies was once a central section of the historic black community, the complex is now far removed from its former neighborhood as the grounds are now contained entirely within the renewed cityscape know as University City.



Approaching the school, one notices a small brick wall that flanks the right side of the stone steps leading up to the main entrance. The wall, approximately five feet high, contains a mosaic of multicolored tiles and a narrative dedicated to the residents of the once famous community.

**Figure 2.1 Wall Outside City High School**

As one nears the wall, one’s gaze is drawn to the upper left corner where the words, “Da Bottom” are written across a large red (broken) heart. In the opposite corner, a bulldozer is seen in the act of demolishing a neighborhood, while residents angrily protest the loss of their homes. The following caption is written beneath the bulldozers:

We were like a big family living close together until the bulldozers of urban renewal came around. They tore down our neighborhood but not our spirit. The Black Bottom still is home in our hearts.

A large map of the neighborhood’s geographical boundaries covers the rest of the wall.

The following text is etched to the left of the map.



**Figure 2.2 Narrative of the history of Da Black Bottom**

The Black Bottom was a predominantly African American community that once existed between 32<sup>nd</sup> and 40<sup>th</sup> streets between Walnut and Lancaster Avenue. Within these boundaries was a community based on loyalty trust and respect. It was born of economic adversity but based on love. Their love was for their community and its members and they cared for each other as family. The children were raised together with pride in their hearts and pride for their community. Prejudice was a stranger to the people of the Black Bottom. The walls of the community were torn down to make way for "urban renewal." However, the sense of community was planted in the hearts of the members proving that a community can thrive even in a field of barren ground. Resistance did not prevent their neighborhood from being physically destroyed, but resistance preserved it in their memories. Even today, the community still meets every year on the last Sunday in August for the Black Bottom reunion at Fairmount Park. It is the largest neighborhood gathering in the history of Philadelphia.

The narrative and etchings at the entrance to City High are reminders of the community's failed attempt to halt the continuing destruction of their homes for the construction of City High School in the fall of 1969. Residents had expressed concerns over the manner in which tracts of land were designated for demolition as early as 1961 when plans for the University City Science center were first unveiled (Carlson, 1999). In the ensuing years, distrust of urban renewal efforts increased as hundreds of homes were

lost and details of the continuing “redevelopment of West Philadelphia” became known (O'Mara, 2005). It was however, the planned demolition of yet another 16 acres of land that occasioned the resistance chronicled on the monument at the entrance to the school.

### *2.1.2 Renewing West Philadelphia:*

Efforts to “renew” West Philadelphia began in 1956 when Martin Meyerson (the University of Pennsylvania business manager) convened a consortium of business and civic leaders to discuss decaying conditions in the neighborhoods surrounding their institutions (Hughes, 1997). The representatives of local universities and area hospitals perceived the residential blight (and increasingly black face of the surrounding communities) as detrimental to the well being of their institutional and business interests (O'Mara, 2005). On July 9, 1959 Gaylord Harnwell, (President of the University of Pennsylvania) along with officials from two area universities and three hospitals formed the West Philadelphia Corporation (WPC) to assist the Philadelphia Redevelopment Authority (RDA) in the development of a renewal plan for West Philadelphia (Rosenthal, 1963). In June of that year, the WPC and RDA announced their plan to build a modern community of science related institutions and facilities to complement the work of area universities and hospitals (Carlson, 1999). The proposed urban landscape was called “University City” in the hope that it would occasion a cultural and economic renaissance that would stem further deterioration of the neighborhoods of West Philadelphia (O'Mara, 2005).

### *2.1.3 Realities of Urban Renewal*

The first renewal effort of the WPC was the construction of the University City Science Center: a four building complex which dominates the 36-39th hundred block of Market Street. Its construction (which began in 1962) displaced an estimated 574 families and razed 106 acres of land (O'Mara, 2005), which “happened to be the center of African American commercial and residential activity for the community” (p. 173). In 1969, the construction of City High school would occasion the demolition of yet another 57 residences on 13.8 acres of land (Oliff, 2000). That so much of the existing community

needed to be ‘redlined’<sup>12</sup>, and so many residents displaced was rationalized by the exigencies of area business leaders searching for ways to safeguard their institutions from “the encroaching sea of residential slums”(Hughes, 1997). What these officials failed to fully address (or chose not to) was the reality that the transforming economies of the time coincident with a history of racially discriminatory employment practices were the root causes of the increasing poverty and residential decay (O’Mara, 2005).

Many of the problems singled out by city officials in West Philadelphia had to do with the area becoming more poor as the African Americans who moved there became increasingly economically disenfranchised as the result of racial discrimination in employment practices and deindustrialization and economic decline in the city and region (p. 156).

By focusing all of their resources on the creation of the new cityscape, the RDA, members of the WPC, and the city’s elected officials did nothing to address the underlying forces that destabilized the economic life of the African American community. Rather they contributed to the socioeconomic deterioration as they diverted vast amounts of financial and material resources for their own capital improvements while doing nothing to improve the quality of life in neighborhoods surrounding their institutions.

#### *2.1.4 Urban Renewal, Economic Exclusion, and Social Isolation*

The continuing deterioration of the communities of West Philadelphia accelerated the exodus of white residents and prompted the outmigration of middle and working class African Americans seeking better life conditions away from the inner city (Jones, 2003). Their departure further destabilized the neighborhoods, as they were the locus of the supportive social networks and local economies that had traditionally stabilized and ordered life within the black community (Bauman, Hummon, & Muller, 1991). The presence of stable black working class residents was a vital component of the community because they provided an “economic and social buffer [that] cushioned downswings in the economy and tied ghetto residents to the world of work” (Wacquant & Wilson, 1989, p. 10).

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<sup>12</sup> Redlining refers to the practice of drawing a red line on city zoning maps to designate properties that will be razed for urban renewal purposes.

The continued outmigration of the black middle and working classes intensified poverty and increased the sociocultural isolation of the poorer less socially mobile residents (Wilson, 1987). Census data for the communities surrounding City High show a continual decrease in the black population and median income, with a corresponding increase in poverty and unemployment rates. Tables 2.1-2.3 illustrate the continuing economic decay and racialization of the communities surrounding City High school (Census tracts 107-109) in the years following the ‘renewal’ of University City.

**Table 2.1 Population, Median Income, and Unemployment Data for Census Tract 107**

<b>YEAR</b>	<b>Population</b>	<b>Average Family<sup>13</sup>Income</b>	<b>%Below Poverty</b>	<b>% Un-employed</b>
<b>% Black</b>				<b>National Average</b>
1970	7,148	27,236	22.0	2.1
96.2				4.9
1980	4,718	25,743	22.5	30.1
96.8				7.2
1990	4,166	18,228	36.0	15.9
97.2				5.6
2000	3,671	15 417	38.9	24.0
96.9				3.9

**Table 2.2 Population, Median Income, and Unemployment Data for Census Tract 108**

<b>YEAR</b>	<b>Population</b>	<b>Average Family Income</b>	<b>%Below Poverty</b>	<b>% Un-employed</b>
<b>% Black</b>				<b>National Average</b>
1970	8,715	22,817	35.0	3.9
97.8				4.9
1980	5,969	18,856	44.3	36.3
98.5				7.2
1990	4,727	21,002	38.3	24.0
97.7				5.6
2000	4,273	17,310	44.3	24.2
95.3				3.9

**Table 2.3 Population, Median Income, and Unemployment Data for Census Tract 109**

<b>YEAR</b>	<b>Population</b>	<b>Average Family Income</b>	<b>%Below Poverty</b>	<b>% Un-employed</b>
<b>% Black</b>				<b>National Average</b>
1970	3,329	22,641	42.4	2.6
95.6				4.9
1980	3,143	17,586	33.4	23.8
96.3				7.2
1990	2,503	18,364	41.6	24.0
95.4				15.0
2000	2,553	13,367	44.1	13.7
92.8				3.9

Census data: (University Archives of the University of Pennsylvania, 2008)

Unemployment statistics: (U.S. Dept. of Labor , 2010)

<sup>13</sup> Average income in 1970 and 1980 adjusted for inflation and is reported in 1999 dollars: CPI =4.54

### *2.1.5 Historical Dimensions and Cultural Understanding*

Although the events surrounding the construction of the University City landscape transpired over the course of (approximately) twelve years, the sociopolitical forces that animate and justify such redevelopment initiatives are part of a larger history of urban social policies (Avila & Rose, 2009), that have historically privileged the interests of wealthy institutions and the politically powerful over those of the poor and powerless residents of inner city urban communities (Wilson, 2007). The blighted, deteriorating conditions of West Philadelphia neighborhoods that so alarmed the membership of the West Philadelphia Corporation were the legacy of a history of economic exclusion (Licht, 1992) and racially discriminatory housing policies (Wolfinger, 2009), that systematically disenfranchised and marginalized Philadelphia's African Americans since the middle of the nineteenth century (Dubois, 1899).

This chapter explores the sociopolitical and economic history of West Philadelphia because it is the understanding of the macroscopic forces that have configured our students' lifeworlds that helps us to genuinely honor | respect their cultural perspectives. Such an understanding facilitates the communication | negotiation across difference which is foundational to the transformative learning environments. In the case of the black neighborhoods of West Philadelphia, such an understanding begins with our analysis of the history of the city's African American freedmen.

## **2.2 PHILADELPHIA'S AFRICAN AMERICAN COMMUNITY**

### *2.2.1 Emergence of the Philadelphia Freedmen Community: 1780-1810*

Dutch settlers first brought African Americans to Pennsylvania in the mid 17th century from Delaware's Chesapeake Bay: slavery was thus an established institution in Pennsylvania before the arrival of William Penn and the Quakers in 1682 (Scharf & Westcott, 1884). Although Penn's "Free Society of Traders" tacitly approved the institution of "serfdom," the ever-increasing slave trade occasioned serious debate among the membership of the Society of Friends (Watson, 1844). Beginning in 1696, the yearly Friends Meetings imposed increasing levies and restrictions upon the importation of slaves, so that by 1775 all members had disavowed ownership of slaves (Watson, 1844). Soon after the end of the revolutionary war, the Society passed the "Act

for The Gradual Abolition of Slavery”, which stipulated that as of 1780, children born of slaves would be considered “bonded servants” until their 28th birthday; after which they would be freedmen (Dubois, 1899). The Act thus set in motion the gradual emancipation of Pennsylvania’s slaves beginning in 1808. In addition to the gradual emancipation, many Friends freed their slaves during the last decade of the century (Clapp, 1896). As a result, the freedmen population in Philadelphia county rose from 2,498 in 1790 to 6,880 in 1800 and to 10,552 in 1810. Table 2.4 illustrates the rise in the freedmen population of Philadelphia between 1790 ad 1810.

**Table 2.4 Population of Philadelphia, 1790-1810 (Dubois, 1899)**

Year	Whites	Negroes	Total
1790	51,902	2,489	54,391
1800	74,129	6,880	81,009
1810	100,688	10,552	111,240

Freedmen in Philadelphia quickly became part of the city’s economic development because slaves in Philadelphia lived in close proximity to their owners and were thus able to learn important skills as artisans and tradesmen during their servitude (Watson, 1844). Once freed, many former slaves were able to use their skills to start a variety of businesses that provided the growing African American community a stable economic and political foundation. Most notable of the early freedmen were Richard Allen and Absalom Jones who established the “Free Africa Society” in 1787 to represent the interests of the emerging community and provide assistance to those in need. (Dubois, 1899) reminds us that the society was “a great step” that

we of to-day scarcely realize: we must remind ourselves that it was the first wavering step of a people toward organized social life” (p. 19).

In 1788 an amendment to the Act of 1777 granted freedmen (property holders) the right to vote thus improving African American’s prospects of becoming fully integrated into American society (Winch, 2008). Important institutions of the emerging black society of this period were the African American Methodist Church (established by Allen in 1790) and the First African Episcopal Church of St. Thomas (the first Negro church in this country built by Absalom Jones and the Free Africa Society in 1792 (Dubois, 1899).

Conditions for the African American community would continue to improve during the first decade of the 19<sup>th</sup> century as freedmen established small businesses, built new churches (by 1810 there would be six in Philadelphia), purchased property (\$25,000 in assets by 1813), and founded eleven benevolent societies to assist the destitute (Dubois, 1899). At one point during the War of 1812, African Americans raised a force of 650 volunteers to protect the city from the British (Scharf & Westcott, 1884). Thus by the end of the war, the African American community had created a supportive social, economic network that helped establish Philadelphia as a thriving metropolis for Pennsylvania's freedmen and a haven for runaway southern slaves. Dubois (1899) notes that the effect of coming to Philadelphia, was to

Stimulate the talented and aspiring freedmen; and this was the easier because the freedmen had in Philadelphia at that time a secure economic foothold; he performed all kinds of domestic service all common labor and much of the skilled labor (p. 17).

### 2.2.2 Destabilization and Unrest: 1820-1840

[a] time of retrogression for the mass of the race and of discountenance and repression from the whites (Dubois, 1899, p. 26).

Conditions would change dramatically for Philadelphia's African Americans following the War of 1812 as rebuilding efforts and the first impulses of the industrial revolution attracted large numbers of European immigrants and Southern migrants to the city's expanding industrial manufacturing labor markets (Hershberg, 1971). During this time, the city's white population grew from 100,688 in 1810 to 173,173 in 1830. At the same time, continued migration of freedmen and fugitive, runaway slaves increased the city's African American population from 10,552 in 1810 to 15,624 in 1830. Table 2.5 documents the growth in the city's population through 1830.

**Table 2.5 Population of Philadelphia, 1810-1830 (Dubois, 1899)**

Year	Whites	Negroes	Total
1810	100,688	10,552	111,240
1820	123,746	11,891	135,637
1830	173,173	15,624	188,797

The rapid increases in the city's population heightened competition for jobs, residential

spaces, and city services which fueled racial antipathies, promulgated by white southerners and anti abolitionists who had remained opposed to emancipation or equality with African Americans (Foner, 1973). Additionally, the majority of the newly arrived freedmen lacked the requisite training to work as craftsmen or artisans as they had learned little during their time as slaves. Whereas the Quakers had made it their duty to provide their servants with employable skills so as to prepare them for their future as freedmen (Watson, 1844), such was not the case with the newly arriving African Americans, many of which failed to find adequate employment (Dubois, 1899). Compounding the circumstances were the racist residential practices, which relegated the growing black population to the narrow streets and alleys of the seventh ward (Geffen, 1969). The growing numbers of unemployed, uneducated, ill trained Blacks, led to an increase in crime, poverty and lawlessness which incited racist tendencies and led to a series of racially motivated mob attacks against African Americans, their businesses, churches, and residences (Scharf & Westcott, 1884) .

Beginning in June of 1829 and continuing until 1842 African Americans were systematically beaten killed, displaced from their jobs, and forcibly removed from their residences (Hazard, 1834). Most notable of these disturbances was a three-day riot (August 12-15, 1834) along sixth and Lombard streets, which destroyed 31 homes, 2 churches, and left one African American dead (Geffen, 1969). The effect of this period was the destabilization of the social and political gains made by the early freedmen. In 1800 freedmen did much of the city's skilled labor as artisans and craftsmen, however by 1837 only 350 of the county's African Americans were employed as skilled workers and these worked predominantly for black businesses : the rest were all either domestics, day laborers, or unemployed (Dubois, 1899). Compounding the loss of material resources was the decision of the Reform Convention of 1838 that determined that black freedmen were not eligible to vote, thus effectively silencing the community's nascent political voice (Winch, 2008). In writing about the events from 1790 to 1837, Dubois notes the following:

A curious comment on human nature is this change of public opinion in

Philadelphia between 1790 and 1837. No one thing explains it- it arose from a combination of circumstances. If, as in 1790, the new freedmen had been given peace and quiet and abundant work to develop sensible and aspiring leaders, the end would have been different (Dubois, 1899, p. 36)

### *2.2.3 Race as Structuring Agent: 1850-1900*

Dubois's analysis is correct, as no single event during this period is responsible for the precipitous decline in social and political capital of the African American community. While much of the discord can be attributed to the competition for jobs and housing occasioned by the large influx of foreign immigrants (Franklin, 1979), it is clear from documented records (Scharf & Westcott, 1884) and eyewitness accounts (Hazard, 1834), that race was at the core of the coordinated, sustained attacks on Philadelphia's African Americans (Watson, 1844). The racial hatred that fueled the violence in the streets (Runcie, 1972), eventually crossed into the workplace as white employees refused to work alongside black workers. Racism became institutionalized as employers acquiesced to employee demands and either fired or refused to hire black workers (Licht, 1992). During this period, African Americans would be unable to learn trades or new skills because they were excluded from apprenticeships (Franklin, 1979) or memberships in unions and trade guilds (Palmer, 1956).

By 1850, racial antipathies had created an environment in which blacks were considered "a race emerging from barbarism." As the forces of the rapidly expanding industrial-manufacturing labor markets transformed the city's economy, racial discrimination and sociopolitical marginalization would severely limit the life opportunities of Philadelphia's African Americans (Foner, 1973). Thus as the growth of the city's economy spurred the expansion of its physical geography, these processes would structure the poverty and racial segregation of the emerging communities of West Philadelphia.

### *2.2.4 Emergence of West Philadelphia Communities: 1850-1900*

In 1850, the population of Philadelphia's population was concentrated within the confines of the "old city," with relatively few citizens (black or white) living west of the city across the Schuylkill River. However, as industrial activity increased congestion and urbanity of the city, wealthier citizens moved to the west in search of more tranquil

residential spaces (Vitello, 2008).

Originally settled in 1677 and given the name Blakeley, the areas across the river were not readily accessible until 1805 when the first permanent bridge was erected at Market Street (Rosenthal, 1963). During the first decades of the century, the area remained relatively rural as large estates predominated the residential spaces. In time, small communities grew around these estates and became known locally as Hamiltonville, (the future grounds of the University of Pennsylvania), Hestonville, Angora, Poweltonville, and the residential area of Mantua (named after a city in Italy by its owner Judge Richard Peters (Garofalo, 2008)). A second bridge erected in 1812 across Spring Garden Street (to the north of Market street), provided access to the residential spaces in Mantua and Poweltonville. The name of West Philadelphia was used unofficially from 1840 until the lands were officially incorporated as West Philadelphia on February 2, 1854. In that same year, the city was divided into wards: all lands to west and southwest of the Schuylkill river were designated as the 24<sup>th</sup> ward (Lloyd, 2008).

Although the bridges across the river made access to the area easier, the population would increase slowly through the middle of the century (6,214 in 1840 rising to 13,265 in 1850), as travel remained relatively expensive. The introduction of the horse car (large carriages drawn by horses on street rails) in 1858 made travel quicker and more economical (Jackle, 1985). As a result, the population began to rise steadily as more of the city's white-collar workers were able to commute from downtown offices to their residences to the west of the city (Hughes, 1997). Table 2.6 shows that by 1860 the population of the boroughs across the river had risen to 23,738 (22,860 Whites, 878 African Americans).

**Table 2.6 West Philadelphia Populations 1850 - 1860 (Lloyd, 2008)**

<b>1850</b>	<b>African American</b>	<b>White</b>	<b>Other</b>	<b>Total</b>
West Philadelphia Population	1,009	12,256		13,265
Blakeley Township	363	5,553		5,916
Borough of West Philadelphia	462	5,109		5,571

Kingsessing Township	184	1,594		1,778
<b>1860</b>	<b>African American</b>	<b>White</b>	<b>Other</b>	<b>Total</b>
West Philadelphia Population 24 <sup>th</sup> Ward	878	22 860		23,738

Major changes would occur during the latter years of the century as improvement in mass transit would make the wards to the west of the city more accessible to the city's middle and working class residents. A second bridge across Chestnut Street in 1866 added additional rail service, thus increasing access to the south of Market Street (Rosenthal, 1963). In 1870, the city divided the 24<sup>th</sup> ward in half along Market Street. African Americans clustered in the 27<sup>th</sup> wards near the river; living in the older housing stock of the area (Jackle, 1985). However, during this decade, a number of blacks would move into the 24<sup>th</sup> ward (north of Market street): thus establishing the African American presence in the area of Mantua.

**Table 2.7 West Philadelphia Population 1870- 1880(Lloyd, 2008)**

<b>1870</b>	<b>African American</b>	<b>White</b>	<b>Other</b>	<b>Total</b>
West Philadelphia Population	1 766	42 551		44,317
24 <sup>th</sup> Ward (North of Market St.)	414 (1.7%)	24,158 (98.3%)		24,932
*27 <sup>th</sup> Ward (South of Market St.)	1352 (7.0%)	18,033 (93.0%)		19,385
The 24 <sup>th</sup> ward was divided in 1866. The 27 <sup>th</sup> ward contains all of West Philadelphia south of Market St., while the 24 <sup>th</sup> contains all lands to the north of Market St.				
<b>1880</b>	<b>Disaggregate Population Data not Available.</b> <b>Total West Philadelphia population in 1880 is 46 071</b>			

The large increase in total population in the last decade of the century (nearly 30,000 whites and 3,000 blacks) was the result of the electrification of the rail lines and the introduction of the electric streetcar in 1893 (Jackle, 1985). Notably in 1871, the University of Pennsylvania relocated to the area thus giving West Philadelphia its first prominent cultural institution (Hughes, 1997).

**Table 2.8 West Philadelphia Population 1890- 1900(Lloyd, 2008)**

<b>1890</b>	<b>African American</b>	<b>White</b>	<b>Other</b>	<b>Total</b>
West Philadelphia Population	4,080	94,940	171	99,191
24 <sup>th</sup> Ward	930 (2.2%)	41,600	26	42,556
27 <sup>th</sup> Ward	2,077 (6.3%)	30,712	125	32,914
*34 <sup>th</sup> Ward	1,073 (4.5%)	22,628	20	23,721
The 24 <sup>th</sup> ward was divided in 1889. The 34 <sup>th</sup> ward includes all lands north of Market street and west of 44 <sup>th</sup> street. There was no change to the lands south of the 27 <sup>th</sup> ward.				
<b>1900</b>	<b>African American</b>	<b>White</b>	<b>Other</b>	<b>Total</b>
West Philadelphia Population	7,137	121,868	105	129,110
24 <sup>th</sup> Ward	2,193 (4.1%)	50,957	50	53,200
27 <sup>th</sup> Ward	3,171 (9.8%)	29,010	23	32,204
34 <sup>th</sup> Ward	1,773 (4.1%)	41,901	32	43,706

The completion of the market street subway in 1907 made it possible for even larger numbers of working class families to relocate to the area resulting in a considerable increase in total population (60.2% increase) during the first decade of the 20<sup>th</sup> century (Lloyd, 2008). The black population also increased significantly during this decade (rising by 50.2%: from 7,137 in 1900 to 10,718 in 1910). In 1910, the growing black population continued to concentrate in the 24<sup>th</sup> and 27<sup>th</sup> wards, (7.3% and 13.2 % respectively) near the growing commercial strips surrounding the mass transit lines (trolley and elevated trains) (Jackle, 1985). Housing was readily available in these areas as black residents could move into homes vacated by more prosperous whites who were relocating to the newly developing 34<sup>th</sup> and 46<sup>th</sup> wards (Greenberg, 1981).

**Table 2.9 West Philadelphia Populations 1910 (Lloyd, 2008)**

<b>1910</b>	<b>African American</b>	<b>White</b>	<b>Other</b>	<b>Total</b>
West Philadelphia Population	10,718	195,257	133	206,108
24 <sup>th</sup> Ward	3,958 (7.3%)	50,377 (92.7%)	35	54,370
27 <sup>th</sup> Ward	3,195 (13.2%)	21,031 (86.7%)	29	24,255

34 <sup>th</sup> Ward	997 (2.0%)	48,555 (97.9%)	23	49,575
44 <sup>th</sup> Ward	1,463 (3.7%)	37,963 (96.2%)	23	39,449
46 <sup>th</sup> Ward	1,105 (2.9%)	37,331 (97.1%)	23	38,459
In 1906, the boundaries of the 34 <sup>th</sup> ward were redrawn and an additional ward: the 44 <sup>th</sup> emerged. The new ward extended from Market Street to the south, Lancaster/ Parkside Avenues on the north, 54 <sup>th</sup> Street to the West and 44 <sup>th</sup> Street to the East. In 1907, the 27 <sup>th</sup> ward was divided and a new ward: the 46 <sup>th</sup> emerged. The 46 <sup>th</sup> ward extended from Market Street on the North, 45 <sup>th</sup> St. to the East, Baltimore Avenue to the south, and the city limits to the west.				

The rapid growth and residential development in the wards of West Philadelphia was the result of the ever-increasing economic activity of the city's vast array of industrial firms (Vitello, 2008). By the turn of the century, Philadelphia had become the nation's preeminent industrial manufacturing metropolis with a vast array of heavy machinery, textile, and metal working firms (Scranton, 1992). The many world-renowned firms would generate great wealth and economic stability for corporate owners and the city's industrial elite (Vitello, 2008). Blacks would however be excluded from participating or gaining any benefits from the city's growing economic prosperity. The endemic joblessness and poverty of the city's black communities during the ensuing century is the result of the systematic exclusion from the city's industrial manufacturing labor markets during the early decades of the twentieth century (Hershberg, 1971).

## 2.3 ECONOMIC PROSPERITY AND RACIAL EXCLUSION

### 2.3.1 Rise to Industrial Prominence Philadelphia 1880 -1920

Philadelphia's role supplying Washington's armies during the Revolutionary War and its position as the country's major commercial seaport (until 1830) had created a vast community of skilled craftsmen, mechanics, and merchants with extensive financial, manufacturing and managerial skills (Scranton, 1992). As the forces of industrialization created the need for innovative technologies and machinery to meet the demands of a changing world, the city's entrepreneurs and businessmen were able to marshal the region's abundant natural resources to meet the nation's demand for industrial machinery and manufactured goods (Licht & Scranton, 1968). By the turn of the century, Philadelphia would be the nation's leader in textiles, ship and locomotive

building, small machinery, tools, and a host of other industrial manufacturing enterprises (Scranton, 1992). Within the region, corporations such as Baldwin Locomotives, Disston Saws, Midvale Steel, Dobson Mills (carpets & woolens), Stetson Hats, Cramp and Sons Shipbuilders and over 20 other leading industrial firms “generated a propulsive momentum into virtually every corner of the manufacturing system” (p. 419).

During this time, powerful economic forces were transforming Philadelphia into the nation’s leading industrial manufacturing center, however, at the turn of the century, less than half of 1% of Philadelphia’s African American males (and no females) worked in the emerging industrial labor markets (Hershberg, 1971). At a time when thousands of good paying jobs were being created, racially motivated discriminatory practices effectively blocked African American access to the emerging industrial labor market. It is ironic to note that within the city that had been the first to emancipate its slaves,

the forces, which shaped modern America, urbanization, industrialization, and immigration operated for blacks within a framework of institutional racism and inequality (p. 203).

### *2.3.2 Economic Exclusion 1900 - 1930*

Though the city was a preeminent industrial manufacturing center, historical patterns of racial discrimination would effectively exclude African Americans from the emerging industrial labor markets, (Licht, 1992). Between 1890 and the First World War, only 4% of the African-American population held an industrial manufacturing job: those that did work in these labor markets were always relegated to the most menial, lowest paying jobs in any of the industries (Foote, Whatley, & Wright, 2003). A review of the employment records of the city’s largest industrial firms: Baldwin Locomotives, Cramps Shipyards, William Sellers, Quaker Lace, (with combined work forces of over 45,000 employees) shows that they did not hire a single black worker until the mid 1930s. The other large firms such as General Electric, Smith Kline and French (a future pharmaceutical corporation), J.G Brill (streetcar manufacture) with combined work forces of over 15,000 employed less than 45 African Americans among them (Licht, 1992).

Black Philadelphians, young and old, in effect never became part of

Philadelphia's particular economic order. Their experiences within the labor market form a separate narrative and on this the historical evidence is staggering (p. 47)

Realtor practices constituted another form of employment discrimination as blacks were denied housing in neighborhoods where factories and mills were located. Residential proximity was the principal manner of securing employment during this era, as information for jobs was frequently passed on by word of mouth (Jackle, 1985); moreover, employers preferred workers that lived near their workplace, as that would guarantee punctuality and allegiance to the company (Licht, 1992). As industries developed, most black Philadelphians were forced to live in the seventh and sixths wards (Dubois, 1899), which were far removed from the neighborhoods where the city's manufacturing and industrial companies were emerging (Licht, 1992). These discriminatory practices formed yet another barrier to African American's full inclusion in the city's developing industrial labor markets. The constraints on employment and housing imposed by racial discrimination would have long lasting and profound consequences on the life narratives of the thousands of blacks who would migrate to the north in search of a better life. As southern blacks migrated to Philadelphia, these discriminatory practices would limit their employment possibilities and sequester them into existing overcrowded black enclaves throughout the city (Wolfinger, 2009).

### *2.3.3 First Great Migration 1916-1924*

During the First World War, prospects of work in the wartime industries coupled with the collapse of many sectors of southern agriculture, attracted millions of black farm workers to the north's industrial centers (Hamilton, 1964). The lure of jobs in Philadelphia's arsenals, navy yards, and tools industries, brought thousands of African Americans to the city (Farley, 1968). Many of the black migrants found work as semi-skilled / unskilled laborers in the city's shipbuilding, and heavy machinery firms. However, after the war ended, blacks once again found themselves jobless or at work in segregated menial positions as traditional patterns of racial exclusion took hold once again (Foote, Whatley, & Wright, 2003).

Though wartime opportunities had ended, blacks continued to migrate northward

throughout the 1920s. This second phase of the migration brought thousands of blacks to Philadelphia giving it the third largest African American population of the northern industrial centers (Miller, 1982). Many of the newly arriving migrants settled in West Philadelphia so that by 1930 the black population of the area had more than doubled (from 19,271 in 1920 to 43,490 in 1930). Census data for 1920 period shows a continuing increase of blacks in the 24<sup>th</sup> (13.5%) and 27<sup>th</sup> wards (12.1%), however by 1930 this pattern shifts as blacks begin to concentrate in the wards to the north of Market street (the 24<sup>th</sup> (23.7%) and 44<sup>th</sup> (26.2%) wards). It is important to note that as blacks move into these wards, the white population decreases proportionately as whites begin to relocate to the 34<sup>th</sup> and 46<sup>th</sup> wards. It was during the 1930s that the total white population began to decline (and continued to do so for the next 7 decades) as many whites decided to move away from the increasingly black face of West Philadelphia. Table 2.10 illustrates the changing demography of the wards of the area.

**Table 2.10 West Philadelphia Population 1920 -1930 (Lloyd, 2008)**

<b>1920</b>	<b>African American</b>	<b>White</b>	<b>Other</b>	<b>Total</b>
West Philadelphia Population	19,271	261,238	182	280,701
24th Ward	8,152 (13.5%)	52,220 (86.4%)	36	60,408
27th Ward	2,927 (12.1%)	21,299 (72.7%)	64	29,290
34th Ward	3,557 (4.9%)	68,275 (94.4%)	34	72,326
44 <sup>th</sup> Ward	3,595 (7.9%)	41,852 (92.0%)	20	45,467
46 <sup>th</sup> Ward	1,040 (1.3%)	77,142 (98.6%)	28	78,210
<b>1930</b>	<b>African American</b>	<b>White</b>	<b>Other</b>	<b>Total</b>
West Philadelphia Population	43,490	258,788	424	303,152
24th Ward	13,041 (23.7%)	41,808 (76.1%)	98	54,947
27th Ward	2,889 (13%)	19,337 (86.7%)	72	22,298
34th Ward	15,400 (16%)	81,018 (83.9%)	92	96,510
44 <sup>th</sup> Ward	11,168 (26.2%)	31,451 (73.7%)	52	42,671
46 <sup>th</sup> Ward	1,442 (1.7%)	85,174 (98.2%)	110	86,726

Although there were increasing numbers of African Americans in the West Philadelphia

of the 1930s, it was not considered a slum as the majority of black residents were living in the older row homes vacated by whites who had moved to “better” residential spaces in wards to the west of the city (Jones, 2004). Thus although the black population had grown during the first migration, the black wards of West Philadelphia remained relatively stable as migrating blacks could find affordable housing (Wolfinger, 2009). This would change dramatically in the years following the Second World War, as the “second great migration” would once again bring millions of southern blacks to the industrial centers of the north. The large influx of blacks would alter the racial balance of West Philadelphia. The combination of an increasing (black) population and the forces of deindustrialization would racialist and impoverish the once stable working-class neighborhoods of West Philadelphia.

## **2.4 RACIALIZATION OF WEST PHILADELPHIA NEIGHBORHOODS**

### *2.4.1 Second Great Migration: 1944 – 1952*

Increasing mechanization and changes in crops of southern agriculture made farming less profitable for black sharecroppers in years after WW II (Sitkoff, 1993). Additionally the involvement in wartime efforts and the struggles for civil rights, made many blacks dissatisfied with historical southern racism (Sitkoff, 1997). Because of these factors, many blacks chose to leave the south in search of new prosperity and equality in the cities to the north. During this second “great migration” (1940 -1970), approximately five million African Americans blacks would leave the south for the industrial centers of the northeast and western United States (Gregory, 2009).

West Philadelphia’s black population grew considerably during the post war years; rising from 57,274 in 1940 to 92,213 in 1950 (a 61% increase). This trend would continue so that by 1960 blacks would number 158,176 (52.4% of the population of West Philadelphia). It is important to note the continuing concentration of blacks and the corresponding decline of the white population in the wards where the black population is increasing. Table 2.10 documents the intensifying racial segregation as the African American population concentrates in the 24<sup>th</sup> and 44<sup>th</sup> wards, while the white population continues its steady relocation to 34<sup>th</sup> and 46<sup>th</sup> wards. By 1960, the white population had

declined from 246,341 in 1940 to 142,370 in 1960: a 61% decrease in population.

**Table 2.11 West Philadelphia Population 1940 -1960 (Lloyd, 2008)**

<b>1940</b>	<b>African American</b>	<b>White</b>	<b>Other</b>	<b>Total</b>
West Philadelphia Population	57,274 (18.9%)	246,341 (81.1%)	237	303,852
24 <sup>th</sup> Ward	18,343 (34.1%)	35,420 (65.8%)	40	53,803
27 <sup>th</sup> Ward	3,334 (13.1%)	17,946 (85.6%)	21	20,971
34 <sup>th</sup> Ward	19,283 (19.4%)	80,286 (80.6%)	44	99,613
44 <sup>th</sup> Ward	14,991 (34.3%)	28,684 (65.6%)	68	43,743
46 <sup>th</sup> Ward	1,653 (1.9%)	84,005 (98.0%)	64	85,722
<b>1950</b>	<b>African American</b>	<b>White</b>	<b>Other</b>	<b>Total</b>
West Philadelphia Population	92,213 (27.9%)	237,528 (71.9%)	424	330,286
24 <sup>th</sup> Ward	36,741 (58.0%)	26,554 (41.9%)	92	63,391
27 <sup>th</sup> Ward	4,110 (13.7%)	25,783 (85.7%)	177	30,070
34 <sup>th</sup> Ward	25,667 (24.0%)	81,313 (75.9%)	87	107,067
44 <sup>th</sup> Ward	23,398 (56.3%)	18,101 (43.6%)	53	41,552
46 <sup>th</sup> Ward	2,297 (2.6%)	85,773 (97.2%)	136	88,206
<b>1960</b>	<b>African American</b>	<b>White</b>	<b>Other</b>	<b>Total</b>
West Philadelphia Population	158,176 (52.4%)	142,370 (47.2%)	1,286	301,832
24 <sup>th</sup> Ward	45,666 (78.8%)	12,126 (20.9%)	195	57,987
27 <sup>th</sup> Ward	4,074 (17.2%)	19,140 (81.0%)	407	23,621
34 <sup>th</sup> Ward	11,692 (23.0%)	39,145 (76.9%)	59	50,896
44 <sup>th</sup> Ward	28,598 (78.4%)	7,780 (21.3%)	81	36,459
46 <sup>th</sup> Ward	40,171 (49.8%)	40,025 (49.6%)	427	80,623

Migrating black workers would find a diminishing industrial manufacturing labor market as the forces of deindustrialization were already dismantling the major manufacturing industries of the northeast. As thousands of black workers seeking high paying blue collar jobs migrated to Philadelphia, processes of deindustrialization-suburbanization (coincident with discriminatory employment and residential practices)

would limit their ability to find meaningful employment.

#### *2.4.2 Deindustrialization*

In the late 19<sup>th</sup> century, rail lines, foundries, and heavy machinery shops dominated the area to the north of Market Street along Broad Street. This area known as Bush Hills was the heart of the rail & heavy machinery industry that made Philadelphia the preeminent industrial manufacturing city in the nation (Scranton, 1992). Though renowned firms such as Baldwin Locomotives, Midvale Steel, and Dobson Mills had established a vibrant economy for the city, civic leaders, competing businessmen, and realtors lobbied the political establishment to shift the city away from an industrial manufacturing base towards an economy founded on real estate, financial services, and commerce (Vitello, 2008). As the new century began, proponents of the “City Beautiful” movement (Lubove, 1968) were able to transform industrial communities (such as the Bush Mills area), by removing the above ground rail tracks, building an underground subway, and engineering the construction of the Benjamin Franklin Parkway. These changes in the city’s economic focus and physical geography weakened the industrial manufacturing labor markets as industries and workers sought to adjust to the city’s changing architecture (Greenberg, 1985). In the ensuing years, changing modes of production, improvements in materials technology and shifts in national and global economies further weakened the vitality of these industries and set in motion the forces of deindustrialization that would decimate the city’s preeminent industrial manufacturing firms (Kasarda, 1989). Table 2.12 illustrates the decline in the city’s industrial manufacturing firms from 1900 to 1950. At the turn of the century (when Philadelphia was at its industrial prominence), 26 of the city’s 50 major firms were industrial manufacturing enterprises (Scranton, 1992). These corporations (20 of the top 25) employed well over 100,000 workers and were the economic engine of the city’s vast industrial manufacturing labor market (Licht & Scranton, 1968). Between the years of 1910-1950, this number would steadily decrease so that by 1950s (at the height of the second black migration) only 10 of those firms remained in Philadelphia.

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**Table 2.12 Industrial Manufacturing Firms in Philadelphia’s 25 largest Firms 1902-1980, (Scranton, 1992)**

	Textiles	Locomotives Ships Heavy Machinery Firms	Steel and Tools	Firms in top 25	New Firms in top 25
<b>1902- 1906</b>	7	6 (1 locomotive 3 ship building; 1 streetcar 1 heavy machinery)	7	20	0
<b>1927- 1928</b>	6	5 (includes 1 Auto body)	3	14	3 Radio parts
<b>1934- 1936</b>	6	5 (includes 2 Auto body)	2	13	5 3 Electronic 2 Petroleum
<b>1956</b>	0	8 (includes 2 Auto body 1 Aircraft 1 Diesel Electric locomotive 2 ship building; 1 Electrical machinery)	2	10	11 9 Electronic 2 Petroleum
<b>1962</b>	0	4 (includes 2 Auto body 1 Diesel electric locomotive 1 ship building)	3	7	12 9 Electronic 3 Petroleum
<b>1980</b>	0	2 (1 ship building; 1 Aircraft Turbine)	1	3	15 9 Electronics 6 Petroleum

It is important to note that by 1956, all of the city's textile corporations had either gone out of business or relocated to plants outside of the city. The loss of the textile firms, which had numbered among the city's preeminent industries since the early 18<sup>th</sup> century illustrates the precipitous decline in industrial manufacturing labor market within the city (Jones, 2004).

The city's textile mills which had sewn the uniforms for union soldiers during the Civil War and contributed significantly to the wealth of the city, began to pull out because air conditioning made manufacturing there possible, but most importantly, because wages were lower in the South and because the labor force there was not unionized. Between 1955 when the textile mills pulled out, and 1975, Philadelphia would lose three out of four of its manufacturing jobs (p. 303).

By 1962, the majority of Philadelphia's industrial manufacturing corporations had either gone out of business (as did Baldwin locomotives in the mid 1930s) or they had restructured and relocated to (suburban, regional (and eventually global)) locations where production costs (principally non unionized labor), tax burdens, and real estate were significantly lower (Kasarda, 1989). As the older industrial-manufacturing firms declined, newer industries (electronics, pharmaceuticals, and chemical processing) and corporations emerged as the leading employers in the region (Scranton, 1992). During

this time, workers with requisite expertise were able to make the transition to newer industries, while others were able to take advantage of educational opportunities and learn new skills. In this manner, many of the displaced workers were able to adapt and transition to the new industries of the time (Palmer, 1956). African Americans did not have the skills needed to adapt to changing economies as they had worked disproportionately as domestics and unskilled laborers and had therefore gained few transferable skills. When blacks were able to secure training for employment in new industries employers continued to discriminate against them once again closing off access to good paying employment (O'Mara, 2005). Losing access to the small number of remaining industrial jobs, and unable to acquire employment in new industries put African American communities in a difficult position at a time when large numbers of blacks were migrating northward (Palmer, 1956).

Negroes are in an especially tenuous condition as job opportunities are shrinking both because of persistent decline in the occupations that usually employ them and because hiring practices tend to discriminate against them (pg. 142).

Although blacks were never an integral membership of the industrial manufacturing labor market, deindustrialization would have profound residual effects on the African American community. The loss of the city's major industries would significantly lower tax revenues and limit the city's ability to provide basic services to its citizenry thus lowering the quality of life throughout the city (Kasarda, 1989). The resulting "flight" of middle class citizens during the ensuing decades would result in part from the lowered quality of life in the city and the lure of emerging labor markets in the suburbs surrounding the city (Avila & Rose, 2009).

Sustained by a steady flow of federal investments, and policies in the form of highways, mortgage interest tax deductions, and early write-offs of mall investments, suburbanization channeled vital resources away from the nation's inner cities, leaving behind a wake of dilapidated infrastructure and radicalized property (p. 339)

### *2.4.3 Suburbanization*

Suburbanization accelerated the processes of deindustrialization within the inner city as surviving businesses chose suburban locations that would provide profit margins needed

to survive rapidly changing economic realities. The same economic incentives that drew industrial firms away from the inner city also prompted the majority of new firms to relocate to the suburban locations. As new electronics, technology, information processing corporations emerged; they too would relocate to suburban locations where labor costs, property values, and tax burdens were considerably lower (Avila & Rose, 2009). The dual effects of deindustrialization – suburbanization led to a considerable loss of jobs within the city of Philadelphia: between 1940 and 1980, the city would lose 400,000 industrial manufacturing jobs (Kasarda, 1989).

Suburbanization of Philadelphia's industries contributed to the racialization of West Philadelphia as it prompted most of the city's white working class families to relocate to the suburbs where manufacturing and new labor markets were emerging (Jones, 2004). African Americans would be unable to access these labor markets as realtors used discriminatory housing policies known as covenants (Freund, 2007), to exclude them from renting or buying homes in the suburbs surrounding Philadelphia. As new labor markets developed in the regions around Philadelphia, these discriminatory practices segregated migrating blacks to the existing neighborhoods in Philadelphia, thus precluding their ability to access these labor markets.

#### *2.4.4 Economic Disinvestment and Racial Segregation*

The great influx of blacks did not immediately create conditions of poverty in West Philadelphia, for many of the incoming families were similar in many respects to the existing middle and working class families of the area (O'Mara, 2005). Poverty emerged in these communities because African Americans were denied employment because of their race. Throughout the city, white workers and employers engaged in systematic discriminatory employment and residential practices so that the new migrants were unable to find work.

Deindustrialization was not the primary cause of black poverty in Philadelphia. Jobs in the manufacturing sector were scarce for African American workers not simply because the factories were closing, but because of the racism inherent in hiring practices. Philadelphia's white workers fought to keep their unions white and practiced informal hiring through kinship and neighborhood network, both of which excluded blacks. Discriminatory housing and mortgage lending practices

also restricted blacks to a limited number of neighborhoods (p. 152)

An increasing concentration of unemployed residents, a diminishing industrial manufacturing jobs market, and little opportunity to enter emerging financial markets, structured poverty and fostered the residential deterioration of West Philadelphia’s working class communities. As crime and residential decay worsened, white residents, reacting to the deteriorating conditions, left the area in large numbers settling in suburban communities farther west and north of the city (Jones, 2004). Between 1940 and 1980 (as noted in table 2.9), the white population would decrease from 246,341 in 1940 (81.1 % of the residents) to 63,850 in 1970 (27.4% of residents).

Though the increase in black population is dramatic, an analysis of individual census tracts reveals the extent of the segregation occurring in specific West Philadelphia neighborhoods. An analysis of the demography of census tracts is relevant to our analysis, as these tracts comprise the neighborhoods in City High school’s feeder pattern. The percentage of black residents in all three tracts rises from relatively small number in the 1940’s to above 90% by 1960 (US Census Bureau, 2010). This trend continues as the number of white residents dwindles to single digit percentages by the mid 1970s.

**Table 2.13 Demographic Change in West Philadelphia (1950-1980) (Lloyd, 2008);**

<b>Census Tract 24C (Census Tract 107 after 1970)</b>					
	<b>%Black Population</b>	<b>Black Population</b>	<b>% White Population</b>	<b>White Population</b>	<b>Total Population</b>
<b>1940</b>	34.6	4,392	65.3	8,305	12,711
<b>1950</b>	72.8	10,402	27.0	3,856	14,282
<b>1960</b>	90.6	7,687	6.8	577	8,487
<b>1970</b>	96.1	6,893	3.0	217	7,175
<b>1980</b>	96.8	4,568	2.0	93	4,718

<b>Census Tract 24D* (Census Tract 108 after 1970)**</b>
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<b>1940</b>	54.7	6,648	45.2	5,498	12,156
<b>1950</b>	86.0	11,698	13.9	1,888	13,596
<b>1960</b>	96.2	11,352	3.7	439	11,805
<b>1970</b>	97.8	8,525	1.7	152	8,715
<b>1980</b>	98.5	5,879	1.1	63	5,969
<b>Census Tract 24E<sup>11</sup> (Census Tract 109<sup>1</sup> after 1970)</b>					
<b>1940</b>	24.2	1,233	75.7	3,853	5,092
<b>1950</b>	59.9	3,473	40.0	2,320	5,798
<b>1960</b>	92.2	4,687	8.3	423	5,081
<b>1970</b>	96.6	3,183	3.8	127	3,329
<b>1980</b>	96.3	3,026	2.5	79	3,143

(West Philadelphia Census Statistics (2008))

#### *2.4.5 Urban Renewal in West Philadelphia*

It is important to note the historical trajectory of the forces that radicalized and impoverished the neighborhoods of West Philadelphia. The racial attitudes that supported discriminatory employment and residential practices in the post World War II years had a history that began with the racial antipathies of the 1820s and continued through the years of the city's rise to industrial prominence. The racist tendencies that excluded African Americans from the manufacturing labor markets denied them the skills and opportunities needed to transition to emerging labor markets of a post industrial Philadelphia. Compounding these exclusionary practices was the legacy of residential segregation that had historically denied African Americans access to housing in predominantly white neighborhoods. As suburbanization moved labor markets out of the city these practices contributed to the economic decay and racialization of the neighborhoods by limiting access to new labor markets and restricting blacks to old, decaying neighborhoods (Avila & Rose, 2009). The combination of these forces fostered

<sup>11</sup> In 1940, the census bureau divided the city's wards into 42 census tracts. The 24th ward was divided into 7 tracts (24A-24G): Tracts 24C – 24E are relevant to our analysis, as they comprise the main neighborhoods in City High school's feeder pattern.

<sup>1</sup> In 1970, a numerical system replaced the lettered ward designations for census tracts. Census tracts 24C -24E became census tracts 107-109 respectively.

the economic decay and residential blight of West Philadelphia (O'Mara, 2005). These were the conditions that “threatened” the universities and medical institutions of West Philadelphia and occasioned the massive urban renewal efforts that continue to this day. The continuing renewal of these communities forms the final chapter of the narrative of the history of West Philadelphia and City High school.

#### 2.4.5.1 University City renewal plan: 1959-1970

The underlying motivations for the renewal of West Philadelphia were the economic interests and spatial needs of the members of the West Philadelphia Corporation (O'Mara, 2005) as all of the institutions (especially the University of Pennsylvania) were in need of additional space for their future capital improvements. A secondary goal of the plan for University City was the desire to create a “community of scholars within the larger urban community” in which the faculty and staff of local institutions would wish to live and raise their families. The families living in this modern dynamic, urban community would require a variety of businesses, retail merchants and service providers that would revitalize the economy of the area. A central component of this “city of knowledge” would be the schools that would educate the children of the renewed urban community (Oliff, 2000).

The WPC’s education advocates, [believed that] by improving educational opportunities, the Corporation would induce middle class families who worked at the local universities, hospitals and businesses, to move to the area. The trend would then give rise to new commercial facilities and an overall enhancement of the residential community. [Such] a desirable community would confer a myriad of benefits on the local institutions including increased safety and leverage to attract students and faculty to the local university. City High school constituted the WPC’s ultimate attempt to initiate the improvement of the University City community (p. 6)

#### 2.4.5.2 The City High School renewal plan: 1962 - 1972

The WPC and the school board proposed plans to build City High school in 1966. The selected site (between 36 street to the east, 38th street to the west, Filbert street (to the south), and Lancaster avenue (to the north)), required 16 acres of land. Of the required acreage, 9.2 acres had already been cleared of homes, however 6.8 additional acres would need to be redlined. The WPC had no authority to condemn property thus it fell upon

the school board (working in conjunction with the RDA to condemn the additional acreage). Unconvinced that the community would benefit from yet another renewal effort, residents of the community protested the planned construction of the school.

During the summer and fall of 1966, community activists, civil rights organizations, and area residents lobbied the West Philadelphia Corporation, the Redevelopment Authority, and the Department of Housing and Urban Development (HUD) to stop further demolition in the area. ‘Negotiations’ lasted months, eventually drawing the attention of the secretary of Housing and Urban Development who froze federal funds for the entire University City project until the project was reviewed (DeLone, 1966). The community however, lost the appeal, as there were very powerful economic and political forces in favor of the renewal of West Philadelphia (Oliff, 2000). Thus in November of 1966, the federal government released funds needed to raze the disputed properties and continue the development of the University City landscape (Carlson, 1999).

#### *2.4.6 City High School*

City High was envisioned as a school that would service the children of University City, and prepare them to work and study within its science and educational institutions. With this in mind, the school’s curriculum designers created an intensive mathematics and science course of study that would give students maximum control of their learning. Under this plan, students (in conjunction with their teachers) would choose their learning goals, design their curricula, set their own pace, and study in small group collaborative settings throughout the school (Salley, 1974).

[City] High School was to represent a new approach to learning in urban education-new in the sense that it would utilize the latest educationally oriented and learning theories to provide a meaningful, individualized education for each student regardless of race or economic background (p. 17)

The school’s plan attracted national attention when the school became one of seventeen schools in the country selected to pilot the ES ‘70 (Education Systems for the Seventies) curriculum. Although the ES ‘70 designation provided additional resources and funding for the school, the proposed curriculum would demand, extensive teacher training, and substantial additional investments from community partners and the school district

(Oliff, 2000). This was not a problem (in the 1960s) as the mood for educational reform was high and the school had many politically powerful supporters. However,

This reliance on community beneficence made the new school especially susceptible to changes in the economy and public interest. Indeed towards the end of the decade, as educational reform became less expedient, institutions that did not view public education as their responsibility became increasingly less inclined to support [City High School] (p. 74)

Such would be the case as changes in the city's political climate would deny the school district access to funds needed to maintain its capital improvement projects. The defeat of the bond initiatives to fund public education in 1969, forced the district to limit expenditures and cancel plans to build a new high school in West Philadelphia. The new school was essential to City High school's planned curriculum as it would have relieved overcrowding in area high schools; thereby allowing City High to open with a small select group of students. A large student body would jeopardize the enactment of the planned ES '70 curriculum, as it was designed for a limited number of students with the academic and social skills needed to engage in self guided individualized learning activities.

Additionally the issue of who would attend the school had never been adequately resolved. The school's designers and the WPC had broached the issues early in their discussions with the school district and had suggested limiting enrollment to highly qualified students from throughout Philadelphia (and the confines of University City). However, the school district failed to make a decision on the feeder pattern as parents and residents of the area, distrustful of the motives of the school board and the WPC, demanded equal access to the new school. After a series of difficult negotiations, the school board and community representatives were able to establish a feeder pattern that would enroll 75% of the students from the community and 25% from throughout the city (Sally, 1974). The diverse student body would allow for the gradual introduction of the ES'70 curriculum as well as an intensive science-mathematics magnet program: these plans however, depended on opening the school at half capacity (1300 students). Final resolution of the issue was delayed, as construction of the school was not completed as scheduled. As a result, City High School "opened" at the E.S. Miller School in the fall

of 1970 with a student body of 200 students. Although the initial student body used the ES '70 curriculum, changes at the University of Pennsylvania, and in the makeup of the school board would end the innovative educational programs at the school.

#### *2.4.7 Decline of City High School*

The political climate in Philadelphia of the 1970s radically changed the city's perspectives towards educational reform (Oliff, 2000). President Harnwell of the University left office in 1970, followed by the resignation of Mark Shedd as school superintendent in 1971, along with three members of the school board. Newly elected mayor Frank Rizzo decided not reappoint the school board's director Richardson Dilworth, the leading advocate for educational reform in Philadelphia's schools. In the midst of these changes in the leadership of the school board and the increasingly conservative political climate in Philadelphia, the school's chief advocates quietly withdrew political (and financial) support for the school. Without the needed political leadership from city officials, or from its former advocates in the WPC, plans for an innovative curriculum at City High would be seriously threatened.

City High School officially opened in December of 1971 (a year behind schedule) with a mixed student body of 2000 students. Soon after opening, 632 students (all African Americans) were transferred to the school to relieve overcrowding at Shaw Middle School (Oliff, 2000). The inclusion of the additional students upset the planned racial and social diversity of the student body. Moreover, few of the incoming students had the academic or social skills to engage in self guided learning packets of the ES '70 curriculum (Salley, 1974). Thus, by the time the school opened, both the size and the makeup of the student body jeopardized the implementation of the planned curriculum. Union grievances over the manner in which teachers and department heads were hired complicated the processes for training and assigning teachers of the ES '70 curriculum. In the spring of 1972, the school board chose to permanently abandon plans to construct a new high school in West Philadelphia: City High would have to relieve overcrowded schools in the area. Soon after this decision, an additional influx of students brought the school to near capacity. Given the number of students and the lack of funding, the principal determined that the school should follow a traditional comprehensive high

school educational plan.

Taken together, the elimination of plans for another new school in West Philadelphia, the addition of several hundred additional black students to the new high school and the removal from the ES '70 program marked the end of innovative education at [City] High School (Olaf, 2000, p. 107).

Thus by the fall of 1972, City High school had devolved into another overcrowded, predominantly African American high school for the urban poor of West Philadelphia. The instability of the curricular program, the large influx of students from various communities, and the rampant crime in the surrounding communities, created dangerous conditions within the school. Soon after the opening of school in 1972, violence engulfed the school. Teachers and students were regularly assaulted as gangs freely roamed the halls of the school. In one instance police assault teams were needed as a group of students “took over” the school auditorium on November 9, 1972 (Thompson, 1972). The school’s principal (Davis B. Martin), was able to calm the violence through a series of discussions that addressed the underlying causes of the violence and he was able to gradually establish a “relatively” safe teaching environment. Over the course of his 15-year tenure, Principal Martin instituted a variety of programs that maintained violence at a minimum and helped improve the educational atmosphere in the school (Vobejda, 1987).

When Martin left, the school would once again revert to a violent, educationally dysfunctional institution as neither of the two subsequent principals (Principal Logan 1987-1992) or (Principal Shitake (1992-1994) were able to effectively control the school (Campbell, Harris, Hong, Mambu, McGinn, & Olson, 2000). Torch Lytle became principal in 1995. He made significant modifications in the organizational structure of the school during his three-year term. During that time, he created the small learning community structure, positioned more of the schools’ teachers in leadership positions, and encouraged community area institutions to partner with the school. His tenure significantly lowered violence within the school as he provided students more opportunities to successfully complete high school. Lytle instituted the school’s first twilight program for students needing to acquire credits for graduation (Dean, 1998). Principal Lytle left the school district in 1998, and his assistant principal Florence

Johnson became head of the school. While Lytle had focused on the school's organizational structure, Principal Johnson focused her efforts on the quality of the high school experience and the rigor of academic programs. Using the small learning community structure, she encouraged the coordinators of each community: (Ecology, Law, Multimedia, Health, Business, SET, (science education and technology), Opportunity, and Motivation-Magnet) to develop rigorous curricula consistent with their community's thematic focus (Campbell, Harris, Hong, Mambu, McGinn, & Olson, 2000).

Florence believed that it was our ethical responsibility to give our kids a rigorous, quality education: she looked out at our kids and saw herself and realized the importance of giving them the kind of schooling experience that would teach and socialize them to become successful well educated citizens. She gave them parties, because she felt that our students deserved to have a nice high school experience: the kids absolutely adored her (Stickney, 2010)

The school's improving conditions in 1999 was the meld of the Lytle's organizational structure and Johnson's belief in the value of a rigorous education. Her "tough love" gave the school a disciplined, rigorous, but caring structure. Principal Johnson continued and expanded liaisons with community partners and local universities. In 1999, she invited Dr. Kenneth Tobin from the University of Pennsylvania to teach and conduct research in one the school's poorest performing learning communities. Dr. Tobin established a research program in the school that would be instrumental in the transformation of the school and in my successful development an urban educator. It would be the combination of these emerging structures in the school that provided the foundation for the successful learning environment in the SET small learning community.

The presence of the university researchers was the result of Principal Johnson's efforts to create a rigorous academic program at City High School. To do so, she believed it necessary to provide her staff a wide array of symbolic, material and human resources that would enable their professional practice. It is however, necessary to note that although these many resources were vital to our successful practices in the classroom, it would be Principal Johnson's energy and vision that catalyzed transformative praxis

within the school. Were it not for her administrative support (including her staff, community coordinators, and teaching assistants), few changes would have occurred within the school. Thus at the start of the 2000 school year, the array of resources within City High school suggested that the school could begin to change its history as a dysfunctional urban high school and finally offer its students the learning opportunity they so richly deserved.

#### *2.4.8 Historical Realities- New Possibilities*

The narrative of the development of the communities surrounding city High is meant to provide a historical context to the economic and sociopolitical conditions of the neighborhoods in which the students of City High School live and grow. It is hoped that our awareness of the realities that structure our students' lifeworlds will help us to genuinely honor | respect their cultural perspectives and in so doing help co-construct the mutual respect and trust that facilitates communication | negotiation across difference. This ability to respectfully communicate with our students creates the interstitial space within which we teachers and students can learn about each other and bridge the cultural divide that so often separates urban youth from their teachers and the culture of the school science community.

Although I was not initially aware of the history of West Philadelphia, my readings of the research articles *Reproduction of Social Class in the Teaching and Learning of Science in Urban High Schools* (Tobin, Seiler, & Walls, 1999) and *Design, Technology, and Science: Sites for Learning, Resistance, and Social Reproduction in Urban Schools* (Seiler, Tobin, & Sokolic, 2001), introduced me to the history of the neighborhoods in the school's feeder pattern. The awareness of the social history of the communities of West Philadelphia (and the culture within those communities) initiated my understanding of the implications of culture within my science classroom. My new cultural awareness would occasion an analysis of my own historical-cultural narrative as my actions were also implicated in the cultural division existing in my classroom. My continued exploration of the history of West Philadelphia would deepen my understanding of student culture and foster my successful enculturation into this community of practice. My awareness of the historical and sociocultural dimensions of

my students' lifeworlds would have a profound affect on the nature of social interactions in my science classrooms.

#### *2.4.9 Sociocultural Perspectives and Social Interactions*

The first two chapters of this thesis have introduced the reader to the sociocultural and historical dimensions that are (in my estimation) critical to successful teaching | learning in the urban setting. Social, cultural, and historical perspectives are necessary if we wish to interact with our students in ways that engender positive emotional energy and build solidarity with the school science community. Moreover, our understanding of the effects of historical processes of oppression and marginalization helps us avoid the deficit perspectives that occasion the symbolic violence and disrespectful interactions that (all too often) destabilize the learning environment. It is unfortunate that I did not have such understandings when I first arrived at City High School, as my actions were in part responsible for the acrimonious and strident altercations that characterized my first months in the school. Although I knew that my first months would be somewhat trying my limited understanding of the complexity of teaching in my new urban setting made it difficult for my students to accept me as a viable member of their community.

The following chapter chronicles the situations I faced as a new teacher in City High School and the structures that initiated my successful enculturation into the SET small learning community. The most important of these structures would be the community of researchers, coteachers, and administrators who created a vibrant supportive community of practice that infused my teaching with provocative, stimulating research literature. The insights gained from my interactions with the university teacher-researchers, initiated my development as urban educator. The successes (and failures) of the year's work helped answer one of this thesis's guiding questions as the combined efforts of community partners, researchers, teachers and administrators helped structure rigorous, challenging learning environments that maximized our student's learning potential. The chapter also details the vast array of human, material, and symbolic resources that enabled the agency of the participants in our learning community. A critical resource that supported my development was the presence of coteachers in my science classrooms. Their presence was an invaluable human resource as it allowed us to teach

students in small group settings wherein they could receive close support in their learning activities. Working closely with our students helped create the trusting respectful relationships that would become the foundation of our transformed learning environment. Additional resources from local institutions provided the materials needed to engage our students in challenging and fun science activities. Although many contradictions remained throughout the various fields in our community, the year's collaborative efforts would make SET one of the more successful learning environments in the school.

CHAPTER THREE  
FOUNDATIONS OF A TRANSFORMATIVE LEARNING  
ENVIRONMENT

**3.1 ENCULTURATION INTO A NEW COMMUNITY OF PRACTICE**

*3.1.1 Terrific Possibilities*

The first time I entered City High School was in late August of 2000. I had accepted the position as science teacher a few days earlier and I was eager to see the school where I would be working. It was a warm summer day and the sun's rays bounced eagerly on the multicolored tiles of a mosaic etched into a small brick wall to the right of the building's main entrance. Several pictures and a narrative dedicated to "Da Bottom" relate the history of the demise of the once famous community. Moving past the wall, I ascended a set of stone steps leading up to the building's main entrance. A series of small mirrors and etchings depicting the faces of members of the community are cemented into the walls near the main entrance. As I neared the buildings main doors, the mirrors captured my reflection making me feel as though I was already a member of the community. It was an extremely aesthetic way to welcome me to my new school.

The building seemed closed, but I found an unlocked door and entered a darkened foyer cluttered with desks, chairs, and office furniture. Long dimly lit corridors led away from the main entrance at obtuse angles forming two sides of the school's pentagonal architecture. The building was eerily quiet save for the far off voices of custodians and the whirr of floor cleaning equipment. I was a bit disappointed as I thought there might be some students in the building, but there were no children about. The corridor to my right had a series of brightly colored bulletin boards hanging on the walls. One board titled, "The Best of the BEST: Class of 2000", had a large photograph of the graduating class. The children in the picture were predominantly African American interspersed with a few Middle Eastern and Asian youth. They were all smiling and proudly wearing their 'City High Class of 2000' tee shirts: their happy faces communicated all of the emotions that come with completing four years of studies in high school.

The silenced intensified and engulfed me as I envisioned teaching in this inner city high school. I wondered about equipment, my room, and the curriculum...what it would be like to teach in this school? Suddenly a strong female voice broke the silence; “May I help you”? Then again more forcefully this time: “May I help you”! The woman before me was dressed in jeans and a work shirt. She stood behind a small cart loaded with posters, banners, construction paper, and other art materials. I explained that I was Mr. Carambo, the new science teacher, assigned to this school: this would be my first meeting with Mrs. Johnson the school principal. She was very excited to meet me, but she was busy preparing the school for opening day. “Can we meet at another time? I have so much to do before the staff arrives.” I said of course, but I wished to see my classroom. She led me to the basement of the school where my learning community was located.

In the summer of 2000, many schools were in a downward spiral, however City High had a partnership with a local university that gave the school access to teaching interns, lab equipment, and learning resources for the science classes. Optimism for the school’s possibilities was increasing and Principal Johnson was determined to continue the momentum. She was extremely excited, about her school, the children, and her staff: her energy was infectious. As we walked, she told me about the school, its recent history, and her plans for continuing improvement of the small learning communities. She had already contacted teacher researchers from the university as she was committed to learning how best to structure a quality science program. She was especially proud of “her” children and felt they deserved to have the best education possible. She left me in the hallway near my room and continued her preparations for the start of school year.

The halls in the basement were equally darkened and almost impassible with desks and chairs as the custodial crews were cleaning and waxing the floors in the classrooms. My room however was still full of desks and equipment, as the staff had not reached this far into the basement. There was one large industrial sink, two storage rooms and six large Formica topped tables. The room was cluttered with science equipment, books, and small piles of trash. I stayed in my new room for quite a while thinking how to organize it and imagining what teaching would be like in my new learning community. Although

the space was darkened and in great disarray, I felt that the room had the potential to be an exciting, stimulating science classroom. Before leaving the building, I paused again at the picture of the class of 2000. These were the inner city urban youth that were so often overlooked in our society. As I looked at their bright faces, I could understand Principal Johnson's deep desire to provide them an education that would prove transformative in their lives.

Although I was new to West Philadelphia, I felt relatively confident that I would be successful with the students in my new learning community. I did not expect an uneventful first semester, as I knew that all teachers go through a time of adjustment in new teaching assignments. The possibility that difficulties would arise as the result of a cultural clash with my students seemed unlikely given my race and experiences teaching African American and Hispanic students from economically distressed neighborhoods. This unfortunately would be the case as I soon discovered that although I considered myself a "member" of the black community, my students would not accept me as a viable member of *this* community. They would construe me as a cultural other and actively reject my attempts to be their science teacher.

In order to be a successful and effective educator in this community, I would have to first bridge the cultural divide separating me from my students. The following narratives and autobiographical accounts focus on the personal, pedagogical and philosophical factors that enabled my transformation during my initial teaching from September of 2000 to June of 2001.

### **3.2 TRANSITION TO A NEW CULTURE: SEPTEMBER 2000**

Given the structure of the learning communities in City High, I was assigned to teach all of the science classes to the students in our learning community: thus I began the year teaching two sections of physical science and two of chemistry. My experiences in the classroom had taught me that students learn best when they work collaboratively in an atmosphere that is supportive and academically rigorous. With these thoughts in mind, I set about to create introductory activities in kinematics for the physical science class, and classification of substances for the chemistry class. I purchased simple

materials and spent the first few days before the first class preparing for the activities. My physical science students would use meter sticks stop watches, and toy cars to learn about measurement, motion, and basic graphing. We would start out by using data from our walking in the halls and then race the toy cars to learn how to graph motion. As an introduction to the properties of matter, the chemistry class would make observations of a variety of objects, classify them based on their observations, and then create an organizational structure for the objects. The activities would serve, as an introduction to what I hoped would be an interesting year of learning. The lessons did not unfold as planned.

### *3.2.1 Science Class*

#### **3.2.1.1 Journal Reflection: Physical Science Class *September 26, 2000***

*Gathering data for the speed and acceleration by walking and running in the halls proved unsuccessful as the students chose to run all of the time, irrespective of the distance markers on the floor. The activity was totally unsuccessful as no one even tried to follow the instructions on the activity guides. The few stopwatches I had purchased began to disappear so I had to remain in the hall to monitor them. I had no control over students' actions. When I spoke, they ignored me as if I were an invisible person.*

#### **3.2.1.2 Journal Reflection: Physical Science Class *September 27, 2000***

*I decided to modify the activity so that we could attempt it again in the classroom. I bought inexpensive toy cars that we could race in the room. We simply had to note the time they took to travel a given distance. We would only have to gather distance / time data that we could use to explore graphing and calculations of speed and acceleration. Once again, the materials were either destroyed or stolen within moments. I had to stop the activity as no one paid any attention to me. I could not continue with the fifth period, as I had no cars left.*

### **3.2.1.3 Journal reflection: Physical Science Class; September 29, 2000**

*Today I decided to give a reading selection and word problems from the book. Surprisingly, this proved more successful in that they remained in their seats. I was still unable to teach as many students simply continued to pay no attention to me. Others were accustomed to the worksheet ethic and began to do the assigned problems. I have given up on the type of questions / discussion interchange that I have become comfortable with, as the students simply did not respond. Questions about simple events evoked no response.*

### **3.2.1.4 Journal Reflection: Chemistry Class: September 28, 2000**

*I have traditionally used an observation and classification activity as an introduction to elements, compounds, and mixtures. Students are given many small bags of various items, which they must first describe and then classify based on the observed characteristics. Once they finish classifying the substances, the groups prepare large posters that explain their system of classification to the class. Each group had at least 15 bags to classify. I had to pause the activity within a few minutes of giving out the materials because students opened the bags and began throwing the contents at each other. I was working at the board and each time I looked around the room, the actions ceased. I stopped the activity when students began throwing screws about the room, as someone could get hurt. When the class dismissed, I discovered that the majority of the bags were open, with their contents strewn about the tables. There was little hope of continuing the next day.*

### **3.2.2 Classroom Realities**

This pattern of destruction and misuse of equipment continued whenever I attempted to do any kind of science activity. Activities stretched into two or three days as I struggled to get everyone settled, restated instructions, or looked for missing equipment. The groups that managed to get past the first day of the activity could not continue because either no data were collected, or the student with the notes was absent so the activity stopped. The ninth grade students proved more difficult as they were new to the school,

but the older students were also quite resistant to me. In all of my classes, I retreated to book learning, as I could not complete any of the introductory activities.

The ensuing weeks were characterized by confrontations and uncontrollable, diffident students who refused to accept me as a viable teacher or engage in any meaningful science learning. Students would sleep in the classes, walk out and roam the halls, break or steal my equipment, and find ways to derail the best-intended activities. During these months, I felt as if the students would never do the kind of science I was attempting to teach or never accept me as their science teacher. The friction and discontent in my classroom worsened with time.

### **3.2.2.1 Classroom Incident: *October 17, 2000***

I ejected Darryl from class today because he refused to take off the earphones and then cursed me out. In the hall way he continues to curse and yell at me through the door. He is threatening to do me physical harm. The students watch me. I try to ignore the provocations but I cannot: he is yelling too loudly. I open my door. My room is directly in front of the coordinator's office. She is at her door so that Darryl is now between us. He continues to curse: "you mother f\_ \_ \_ \_ \_ . I'm going to f\_ \_ \_ \_ you up"!! Students have emptied the two rooms that are to the left and right of my door. As I step into the hall, Darryl and I are face to face and surrounded by students, and teachers. It is a huge commotion. He continues to yell at me: cursing, "I'll f\_ \_ \_ \_ you up, you...."!! I am frozen in space and cannot move or speak.

Later I would realize that Darryl was unleashing the pent up emotions of many students. As much as I wanted to be a good guy and be their friend and mentor, I was doing them great symbolic violence in my tone, demands, questions, and overall demeanor. Unfortunately I did not know how responsible I was for this event and I COULD NOT, WOULD NOT, yield my ground, because I too was quite frustrated with these students.

Darryl and I grow closer and closer together. The tension is palpable: he balls up both his fists, I do not move. Time seems to stop. (It felt as if we were

standing there toe to toe for an eternity). Suddenly Darryl lunges to hit me, but some students grab his hands and restrain him. By this time, the school police arrive as my coordinator had called them. Darryl is handcuffed and arrested. He is taken to the local police station and booked for assault. The incident alienated many students as I was seen as a teacher who had little control over his class. The only way to “win” was to have students ejected or arrested: The incident proved that I had no personal power in my own classroom.

### *3.2.3 A Different Cultural History*

These and other similar encounters were shocking and disorienting to me as I considered myself similar to the children in this community. City High School is a school not unlike my own high school in Boston, Massachusetts. The majority of the students are African American from families with limited economic resources, and many are from single parent homes. I am a black person and I too grew up in a single parent home. As a Cuban immigrant with limited education, my mother always worked two jobs, which provided very little economic security.

I had grown up in an era when black people cherished an education and I had chosen to become a teacher, as I believe that a quality education is an indispensable component of a successful life. What I realized as I faced Darryl in the hallway was that the similarities between me and these students were superficial, and my good intentions were seen as insulting and demeaning. I had expected a difficult period of adjustment, but the reactions of these students were no mere ritual: their actions suggested a complete rejection of me, my teaching style and my attempt to become part of their lives. Thus early in the fall of the year I found that I had no idea as to how to resolve the ever increasing discord within my science classes. An excerpt from an interview with Wolff-Michael Roth sums up my experiences during my first months in my new school.

#### **3.2.3.1 Interview with W-M. Roth: *October 5, 2001***

Cristobal:

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. The kids at City

High were so marginalized, unprepared, and hostile that I was totally lost. There was no way of being an affable, friendly person, nor 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 (Roth, Tobin, Elmesky, Carambo, McKnight, & Beers, 2002, p. 12).

### **3.3 THEORY INFORMS PRACTICE: A TRANSFORMATION BEGINS**

The resolution of the impasse (as well as the beginning of my successful enculturation) began with the reading of articles written by a group of researchers in another small learning community in our school. A commentary in one of their studies seemed eerily similar to my experiences:

The resistance begins in the hallways as I enter the school. At the doors, I push through a crowd of students trying to beat the 8:15 a.m. deadline imposed by the school. As I walk along the ground floor corridor toward my classroom, I see many of the students from my class. They seem to ignore my presence. If I greet them, there is only the slightest acknowledgment that I even exist. When I open the door to the classroom few enter and some of those who are at the door may choose to wander around the hallways, to return some 15 minutes into the class period. Day after day, it is the same pattern (Tobin, Seiler, Walls, 1999, p. 175).

I was amazed to read these words, as they seemed an exact description of my teaching reality. Student resistance created a barrier that precluded the kinds of relationships and learning experiences needed to create a transformative learning experience. Resistance took the form of continual absences, apathy, unpreparedness, and an unwillingness to engage in open-ended inquiry learning. Student “oppositional culture” prevented them from fully engaging in the science curriculum and directly contributed to the reproduction of their marginalized educational status.

At the end of the 10-week semester most of the students had earned a failing grade. Hence, with very few exceptions, the production of those enrolled in the chemistry course fuelled the cycle of social reproduction in which these students who began the course disadvantaged with respect to students in other Sacs and schools completed the course with their disadvantage reified (Tobin, Seiler, Walls, 1999, p. 186).

The researchers’ use of sociocultural perspectives to frame student activity, proved invaluable to me as it provided a theoretic, through which I could begin to understand the nature of the resistance and opposition I was experiencing in my classroom.

Although I had taught in an urban environment before, this would be the first time that I fully considered the historical, social, and economic realities of the worlds outside my classroom. The students in the studies (and throughout City High) are predominantly African American living in segregated persistently poor neighborhoods. Their history, and socioeconomic status position them as members of a minority culture that differs (in many respects) from the dominant cultural perspectives that inform the institutional policies of schools (Bourdieu, 1974) and the (dispositions and social practices) of the school science community (Barton, 1998). The resulting cultural incongruities give rise to resistance and oppositional culture as students attempt to enact culture that affirms and protects their sense of self (Willis, 1976).

John Ogbu (one of the first sociocultural theorists I would become familiar with), suggests that the history of the interaction between minority and dominant cultures give rise to distinct categories of minority status (voluntary and involuntary minority) that are relevant to an analysis of resistant cultural production (Ogbu, 1992b). Voluntary minority groups become members of a particular society by choice: for these groups, the crossing of cultural borders is considered a rite of passage to a better and more inclusive life. The loss or modification of their primary cultural systems does not jeopardize their sense of self as a cultural transformation and acceptance of dominant cultural values is a desired end.

Involuntary minorities, on the other hand, are those subgroups of the population that were brought into a given society against their will: thus their economic, political, and social history is one of subjugation and domination. Involuntary minorities respond to their exploitation by developing cultural practices that protect their sense of identity by the rejection of dominant discourses or by the creation of insular, exclusive cultural habits that disavow the importance of dominant culture (Fordham, 1996), and reaffirms their sense of place in the world (Boykin, 1986). At times, these practices are characterized as inversion of the dominant cultural styles as they seek to reject any cultural practice that corresponds to practices of the dominant culture (Willis, 1977). As I read more of the literature, I came to understand why my students (given the history of

African Americans in Philadelphia) would enact resistant, oppositional culture of an involuntary minority group.

This (I would soon discover) was a principal difference between my students and me as my family had willingly immigrated to this country in the late 1960s. Given that we had migrated in search of a “better life,” my mother had worked tirelessly to adopt the language, cultural perspectives, and social practices of our new American home. I had therefore been socialized to fully accept dominant cultural perspectives as part of my cultural identity. Understanding how our differing life histories affected our cultural enactment in the classroom would be the first step in my enculturation into my new teaching community.

Additional readings in the literature of African American anthropology introduced me to new ways to conceptualize salient aspects of the culture of the urban youth of Philadelphia. In addition to the work of Ogbu, the writings of Lisa Delpit, Wade Boykin, and Elijah Anderson provided vital insights on the construction of power and authority (Delpit, 1988), styles of interaction (Boykin, 1986), and cultural codes of inner city youth (Anderson, 1999).

### *3.3.1 Readings in African American Anthropology*

#### **3.3.1.1 Journal notes: November 11, 2000**

*I have discovered some provocative readings that may explain the disharmony in my classes. Delpit's *The Silenced Dialogue*, (Delpit, 1988) suggests differences in the teacher's and minority students' cultural perspectives on power, authority, and modes of oral interactions as sources of discord leading to a cultural clash in the classroom. She cites work by Shirley Brice Heath, (Heath, 1983) on the style of oral communication characteristic of minority children's interactions with their parents to explore minority children's conceptualization of authority and respect. Delpit looks at styles of oral interactions in the home cultures of Black children and suggests that for many urban poor children, authority and respect are gained through the explicit display of personal power. She notes that many people of color expect authority to be earned by personal efforts and*

*exhibited by personal characteristics: in other words, the authoritative person gets to be a teacher because she is authoritative. Some members of middle-class cultures, by contrast, expect one to achieve authority by the acquisition of an authoritative role: that is, they believe that the teacher has authority because she is the teacher.*

I had noticed early on that many teachers and teaching assistants spoke most instructions in a very direct and gruff manner. Their style of communication was direct and explicit. There was no animosity in their voice, but clear authority was implied: compliance and respect were expected. Our principal would call this “tough love.” The authority she wielded emanated from her history within this culture; I as a cultural “Other” could demand no such allegiance from my students. As a result of my cultural foreignness, my students continually misbehaved and I reacted and imposed harsh but ineffective punishments. The more “normality” I demanded, the more students resisted. My anger, the cursing, destruction of property, and other anti social behaviors exhibited by my students, were a “pathology that result[s] when two parties interpret each other's behaviors from different cultural frames of reference” (Norman, Ault, Bentz, & Meskimen, 2001, p. 1104). These differing cultural orientations may prompt the teacher to exercise authority and students to assume identities in ways that exaggerate conflicts: as a result, schooling itself may hold different symbolic meaning to different groups. My readings suggested that in order to avoid conflicts, educators in these circumstances should

interrogate [our] cultural orientations with a view to laying bare and eliminating the veiled individual and institutional cultural impediments to truly caring classroom relationships” (ibid).

As events grew more strident and difficult, I understood that my first task would be to fully investigate my lived history for the roots of my assumptions on authority, power and the role of the teacher. Unless I fully understood my cultural perspectives, my expectations and misinterpretation of my students’ responses to me would further alienate us one from the other. I had read William Pinar’s *Curriculum as Autobiographical Text*, (Pinar, Reynolds, Slattery, & Taubman, 1995) in graduate school and his words now echoed in my life:

Only via deconstruction [of the self] can a reformulation of self begin, a self not frozen and overly fixed psychologically or socially, capable of perceiving and processing new information according to constantly adjusting notions of reality, the future and the past (p. 19).

As I interrogated my history for insight on the discord in my classroom, two biographies emerged: one of my early years as a Cuban immigrant, the other as a social activist of the late 1960s. The two narratives though relevant seemed at odds with each other.

### *3.3.2 Autobiographical Text*

#### **3.3.2.1 My Early Years: Havana Cuba**

*My learning begins with my father. I can remember laboring over figures written in a black and white composition notebook, with my father exhorting me to do well in my studies. His job as a telegraph operator was a relatively high achievement for a black person in Cuba of the 1950s, and he attributed his success to his education. My mother who had failed to finish grade school, was also determined that I get a good education. A good education, for my parents was a gateway to a successful life. My mother and I immigrated to the Florida in 1956. My father stayed behind in Cuba, thus my mother would raise me by herself.*

*Looking for a permanent home took several years: we eventually settled in Boston Massachusetts in the fall of 1959. Hispanic families were at that time authoritarian and (in my case, deeply religious) thus I grew up with a profound respect for all adults and a fervent desire to do well in school. There were very few Hispanic families in Boston at that time, so my mother adopted the values she assumed would make us respected and successful American citizens. These values were solidly middle class as we were living in a mostly white middle class community.*

*I went to elementary school during the civil rights protests that desegregated schools, thus I experienced the political (and human) costs of an education. These sentiments were deepened during my first years in high school when the civil rights protests intensified as Black communities demanded equal access to*

*institutions of higher learning. In those years, we were living in a predominantly Black neighborhood, and I and my friends felt a responsibility to respond to the efforts of our leaders by succeeding in school. In the summer of 1964, I was selected to become part of an enrichment program for inner city youth. I attended prestigious all white, private schools for two successive summers and then in my junior year I joined the Upward Bound program. The program (funded by Lyndon Johnson's Great Cities program) was meant to enrich the lives of poor minority children. In my case, it had the unintended effect of challenging most of my earlier beliefs and producing a second radically different socialization.*

### **3.3.2.2 Teenage Years in Boston: Summer 1967**

*The summer of 1967 would be the first of two years in the Upward Bound programs. That summer would be the first time I heard jazz, read African American literature and the great revolutionary American and Latin American poets. In my English classes, I discovered Malcolm X, Imam Baraka (Leroy Jones), Richard Wright, Pablo Neruda, and many other critical writers. During that summer, historic race riots engulfed the nation's urban centers. It was also the summer of growing counter culture movements. I would meet my first social activists, hippies, and Latin American revolutionaries. I would learn that American society was inherently unjust because it worked to enforce racial and economic inequity here and throughout the world. Learning took on a political and revolutionary aspect because it worked to liberate the person that society worked to repress. My learning contradicted all of my earlier social values: by the end of my senior year, I had lost my desire to be a part of the established society of this country.*

*During the summer of 1968, the entire country was rebelling against all forms of repressive value systems. I too rejected many of my core beliefs and values. I did not plan to go to college but the university where I had attended Upward Bound accepted me: I enrolled in the fall of 1968. I immediately joined the Black*

*Students Union, and within two months, we had staged a major take over of the University's communication building (Time Magazine, 1969). Our demands ranged from increasing Black attendance to making the courses less Eurocentric and more relevant to the cultural identities of the African American students. The take over ended peacefully, but I and a few other students continued to boycott the core courses we felt were irrelevant to our realities. I failed Western Civilization and Psychology, and barely passed my writing courses. Refusing to learn was now an act of rebellion.*

*I left school in 1969 and joined the Black Panthers Party. I was an active member until early in 1971 when an ideological debate began to split the Party. I was quite mystified and disappointed when dissent was stifled. The party actively "disciplined" and ostracized defiant members who did not accept the "official party line" (Time Magazine, 1971). The Party once it became vested in maintaining power over its membership had become hegemonic and oppressive. I grew disillusioned with the enforced compliance to the new doctrines and left the Party in protest.*

*Upon leaving the Panthers, I found myself drawn to many area artists whose work was political but not aligned to any institutionalized movement. I discovered that Artists could embody revolutionary ideals, and remain free of institutions that would limit their critical voice and intellectual freedom. I was interested in photography, so I enrolled in Antioch College's alternative school of art in Baltimore in 1972. As part of my studies, I registered for a theatre course, as I had worked in a few plays during Upward Bound and I had enjoyed performing. The theater class was taught by a former member of the Open Theatre, which was known internationally for its critiques of social and political oppression. Our teacher- director embodied far-reaching intelligence, an ever-evolving sense of self, and a belief that artistic expression should promote social justice. In the spring of 1973, we formed a performance group in a local theater. In addition to our work as performing artists, we spent several days each week teaching drama and movement to boys in the Maryland State Reformatory. Our classes provided the youngsters a means to creatively explore and express their*

*emotions. This would be my first time as a teacher, and although the work with the young men was very difficult, I discovered that teaching was a truly gratifying experience.*

*In the summer, our theatre group decided to relocate to New York City. This was in 1973: the country was still reeling from unresolved racial tensions, the fractious political climate of the Nixon White House, and an intensifying anti-Vietnam war movement. As experimental theatre artists, my friends and I performed in street plays and many Off Broadway productions that critiqued social and political inequities in our society (Marwick, 1994). Performing provided me a venue, through which I could express my political beliefs without compromising my personal and intellectual development. I would perform and teach in this alternative artistic society for the next sixteen years: it would be the perspective from which I would learn the greatest lessons of my adult life.*

### *3.3.3 Differing Perspectives on Power and Authority*

As I explored my life narrative, I realized that my history had produced two conflicting perspectives on power and authority. One notion was informed by my early life, suggested that teachers should be vested with authority and respected because of their position: thus I expected that my students would respect me because I was the teacher. However, Delpit's readings suggested that I had to earn my students' respect by acting in an authoritative manner and actively displaying my personal power. This was very difficult for me because my experiences as an adult had made me deeply suspicious of institutions and the power they wield over individuals. In speaking of middle class teachers in urban schools, Delpit notes that teachers (like me), "purposefully downplay the explicit display of power because they feel that its exercise contradicts their more liberal principles" (Delpit, 1988, p. 288). Her description of this type of teacher as "those whose beliefs include striving for a society based upon maximum individual freedom and autonomy" (ibid) accurately described my personal beliefs.

My attempt to claim authority that I had not yet earned was at the heart of the disrespect aimed at me. The expectations that these students should respect my authority as their teacher because of my position is a cultural orientation that is the exact opposite of their

beliefs about power, authority and respect. My distrust of institutional power and unwillingness to exert power over them suggest to these kids that I had no personal authority over them; they then misbehaved and I become incensed because my culture suggested that I should be respected as teacher. My anger occasioned symbolic violence and disrespectful interactions, which fueled confrontations that I could not control. Thus with each passing day our differing cultural perspectives increased the disharmony and distrust in my science classroom.

### **3.3.3.1 Journal Reflection: Classroom Incident: November, 9 2000**

*This is the last period class. I have a particularly difficult time with these students because they are tenth graders who are particularly defiant of me. Given the time of the day they are usually tired and unwilling to engage in any active learning. They prefer to sit and do worksheets or nothing. They never bring school tools, or if they have them, they are lost by the end of the day. This day I refuse to be intimidated by two young men in the back. I throw them out when they refuse to stop listening to their CD player. Their friends complain. One of the girls protests that I am too strict and unfair. I respond that she too can be dismissed. In fact, I tell them that I am willing to teach only the willing learners. "If you don't want to learn then leave"! I am at the top of my anger. At this point, the entire back row of students gets up and leaves the class. I am flabbergasted. The class is small to begin with, and I am now left with but four students. Eleven are in the coordinator's office. This is a revolt! The coordinator is always supportive of me, however she looks into the room to see what is happening as most of my class is in her office. I explain the circumstances and she asks what I want to do. What disciplinary action did I wish to pursue?*

This incident occurred in the tenth week of the new school year. My classes were continually confrontational and contentious. I had experienced many individual confrontations, but a group action was further proof that I was somehow seriously at fault in all this. By this time, I had had enough confrontations to realize that something was seriously wrong in my teaching practice. This was the start of the turning point for

me as I chose to go into the office and talk to the students. As we sat in the coordinator's office, they continued to (loudly!) voice their complaints.

“You are always angry...”

“You too serious”!

“You are no fun”!

“ You don't understand us.”

They explained that they were all tired at the end of the day and that I always demanded too much of them. They wanted the class to be more “fun” and suggested that I made them feel as I did not like them. Although the circumstances were trying, I was almost relieved to hear their comments, as I truly had no idea why they we seemed to dislike me so much. I agreed that this had been a very trying year for me, and I reminded them of all the difficult events that had befallen my attempts to teach. They agreed that they were not the best-behaved group. I too agreed that I was a bit onerous at the end of the day and so I promised to not be so angry with them if they misbehaved. We agreed that some behaviors such as listening to their Walkman, talking (too much or too loudly) during the entire class, or leaving the room were not acceptable. We agreed to change the format of the class so that they could have a few minutes to relax and talk with each other before the class started. I would give them more group work during which they could talk and move about the room.

This would be my first cogenerative dialogue (Roth, Lawless, & Tobin, 2000) with students. In a cogenerative dialogue, each of the participants is free to voice their opinion without fear of reprisal or condemnation (LaVan, 2005). All of the participants in the dialogue work to assess contradictions in the classroom field and then cogenerate a solution to that will enable the agency of all members of the class (Martin, 2005). In our discussion, my students were able to openly tell me what was bothering them and how they would alter the classroom dynamics. I too was able to voice my opinion of their behavior and what I wanted them to achieve in our classroom. The conversation that afternoon was the first time my students and I were able to understand each other's perspectives on teaching and learning.

### *3.3.4 Emerging Cultural Understandings*

Although the resolutions we reached that afternoon provided a respite from our continued difficulties, the improvements were but initial first steps, as many students had still not accepted me as member of the community. Though at a seeming impasse, it was comforting to know that our cultural differences were not irreconcilable and (more importantly) that my students were willing to work to improve the classroom atmosphere. As I considered how best to structure the classroom atmosphere, I remembered the following set of recommendations that I had read in Delpit (1988),

- Establish meaningful relationships that garner student respect
- Control the class through exhibitions of personal power
- Show strong belief that students can learn.
- Establish rigorous standards of academic achievement and demand excellence
- Incorporate Black interactional styles of communication into my teaching (p. 288).

#### 3.3.4.1 Importance of Respect in the Urban Classroom

Until each student respects the teacher and is willing to construct that person as his / her teacher there is little point in proceeding with a curriculum that provides students the autonomy and opportunity to learn through inquiry (Seiler, Tobin, & Sokolic, 2001, p. 762)

Delpit's suggestion that educators should "establish meaningful relationships that garner student respect" was particularly evocative, as I had recently read a text (Seiler, Tobin, & Sokolic, 2001), in which researchers had used "the currency of respect" in their analysis of student activity. Although they had created a rigorous inquiry based "design curriculum" students had refused to engage in the learning of science as they were engaged in cultural activity informed by codes emanating from their lifeworld. What they had originally considered resistant behavior was in fact a quest for a currency more valuable than the science content: respect. The acquisition and exchange of this currency was guided by cultural codes emanating from their life on the streets. The "Code of the Street" as theorized by Anderson (1999) was as a

[set] of informal rules governing interpersonal public interactions especially violence. At the heart of the code is the issue of respect -- loosely defined as being treated right or being granted one's props (or proper due) or the deference one deserves" (p. 33).

Anderson suggested that respect was vital to our students as it was the "currency" that was used to negotiate their safety on the very dangerous and violent streets of their communities. The "rules" of the code were quite strict and failure to show proper respect would be taken as the sign of impending violence. I knew of this as I had witnessed many altercations occasioned by one student "disusing" (or showing disrespect) to another. That such a code existed was evidenced by the many fights that occurred in our building around the issue of respect. It was also very likely that much of the difficulty in my class had occurred because I had inadvertently disrespected my students in numerous ways.

As I considered the role of respect in my students' lives, I came to understand the importance of our first group discussion. Although there were still instances of misbehavior, the class seemed more relaxed, more attentive to my instruction; we often laughed together: at times and they seemed to genuinely like me. Considering Anderson's "loose" definition of respect I came to realize that our actions towards each other had demonstrated great amounts of respect. Our attention to each other's perspectives and our willingness to defer to each other's needs was a form of "granting each other's props." Subsequent to that day, each time we chose to listen to each other or chose to defer to the other's needs was a sign of respect. With time, our respect for each other grew considerably. It was the emergence of this mutual respect that occasioned my eventual successful enculturation into my new teaching community.

A willingness to listen to my students and "give them their props" has since characterized my interactions with students. As I noted in the introduction it is important that we forge new cultural relations with students if we wish to afford them the opportunity to reconfigure science in ways that are personally meaningful and transformative. Demonstrating respect by finding ways to negotiate with students has since become a defining aspect of my praxis. The ensuing months would be a time when

my students and I would slowly learn about each other. The success of my enculturation depended on this prolonged period of watching and learning about each other.

Based on our ongoing research on urban science teaching and learning it is evident that teachers need time and face-to-face experience to adapt their teaching to the cultural capital of urban youth – similarly urban youth need time and face-to-face experience to adapt their cultural capital to teachers across the boundaries of age, race, and class (Tobin, 2006, p. 219).

#### 3.3.4.2 Interactional Style

Delpit's (1988) notion that there was a black interactional style of communication resonated with me as I had noticed a distinct manner of interaction between students and many of the school's black staff members. The "style" was also referred to in Boykin's (1986) text, *The Triple Quandary and the Schooling of African American Children*, which elucidated nine "interrelated dimensions of Black culture" that organize and orient the Afro-American experience in this country. Five of these dimensions were salient to my enculturation as they detailed modes of social interaction that were not part of my cultural toolkit.

- Movement, an emphasis on the interweaving of movement, rhythm, and percussiveness
- Affect, an emphasis on emotions and feelings, together with a special sensitivity to emotional cues and a tendency to be emotionally expressive
- Verve: a propensity for relatively high levels of stimulation to action that is energetic and lively.
- Expressive individualism, the cultivation of a distinctive personality and a proclivity for spontaneous, genuine personal expression.
- Communalism, a commitment to social connectedness, which includes awareness that social bonds and responsibilities, transcend individual privileges (p. 61).

My readings of the Boykin and Delpit articles did not immediately change my teaching style or mode of interaction with my students, however they did provide a lens through which I could evaluate the differing cultural perspectives in my class. Understanding that we each conceptualized power, authority, respect, and interactions differently

helped diffuse potential misunderstandings, as I was now more aware of how my students might interpret my actions.

As my students and I grew more accustomed to each other, my teaching would become more energetic, enthusiastic, and emotional (Roth W.-M., Tobin, Carambo, & Dalland, 2005). My developing style of interaction allowed me more control of my class, and provided me a modicum of personal power and authority. My ability to “control the class” helped me to exert my authority over misbehavior (in a respectful manner) and thus show that “I was in charge.” This would garner respect for me as teacher since (as Delpit (1988), noted) they granted me authority because I was able to claim it through my actions. Though not in my nature to claim authority, I learned to do so as part of my enculturation into this community. Given my newly emerging social capital, I was able to demand more of my students and establish standards for high academic achievement. Our work together helped me demonstrate the respect I had for them and in so doing communicate my strong belief in their inherent possibilities.

### **3.4 TRANSFORMATION OF A LEARNING COMMUNITY**

#### *3.4.1 A Transformation Begins*

Although my interactions with my students had improved the quality of teaching, additional structural resources were needed to fully implement a challenging science curriculum. During the Christmas break and into early January, I undertook the task of painting, cleaning and refurbishing the room. With support from the Access Science program, my coordinator, and my principal, I ordered new science equipment, chemicals, and textbooks. Thus by January of 2001, my classroom had acquired the necessary material resources to provide students with a challenging inquiry based science curriculum. Though these resources were vital to our evolving science curriculum, the transformation of our learning community began when two coteachers and researchers from the University of Pennsylvania joined our learning community.

#### *3.4.2 Coteaching in the Science Classroom*

In January 2001, two student teachers from the University of Pennsylvania’s Graduate School of Education were assigned to my science classes. The student teachers, along

with cooperating fellows from the Access Science<sup>14</sup> program, helped coteach many of our science classes and laboratories. Although my coteachers were student teachers, we shared equally in all aspects of the classroom dynamics (Roth, Lawless, & Tobin, 2000). Coteaching was (and remains) a dynamic co-participatory activity (Roth W.-M. , Tobin, Carambo, & Dalland, 2005), in which all teachers take full responsibility for the enacted curriculum. The coteachers in my classroom gave me the opportunity to more fully understand my students' academic needs and then make appropriate adjustments to the unfolding curriculum (Carambo & Blasé, 2010). Additionally, my close working relationships with my students gave us each the opportunity to become more familiar with each other and bridge the cultural divide separating us. Coteachers would for these reasons, become (and would continue to be) the most important structural component in my successful enculturation and in the transformation of our learning community.

Cristobal's participation in coteaching provided him with opportunities to build social capital. In one-on-one meetings, he could show to many students that he cared. Not only is Cristobal a friendly person who easily smiles, but he also is a listener with a great deal of empathy for his students. He helps in almost every way imaginable and he is in the school building consistently before, during, and after school. In this way, the students can rely on his presence and if they have a problem they seem aware that he will listen and help if he can. Showing his care in a consistent way sets the stage for building trust and rapport; essential components of the social capital that is requisite to becoming a teacher in a school like City High (Roth, Tobin, Elmesky, Carambo, McKnight, & Beers, 2002, p. 23).

### *3.4.3 Improved Structural Resources Enable Student Learning*

With the assistance of our coteachers (and Access Science fellows), I was able to institute a program of weekly labs in our science classes. As the semester proceeded, the labs and inquiry activities became central to the classroom and the community. Many smells emanated from the classroom, ("Oh man it smells in there!"). Students passing by would stop at the door and shout, ("Yo, what you doin in there?" "What's that?") Eager students would invite them in and show their experiences to their classmates: ("Hey come here, look at the shape these iron pieces make on the magnet.")

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<sup>14</sup> The Access Science Program was a federal program that provided funds for science outreach programs to local universities. Through the Access Science program, our local university provided "access" to science supplies, equipment, and teaching assistants.

Each activity required students to make careful observations, reflect on their data, construct reasoned explanations based on their evidence and engage in negotiation of their knowledge claims with their classmates, or the various teachers in the room. Engaging in these discursive practices was significant because they define meaningful activity within the scientific community (Lemke, 1990), and they are essential components of good science learning (Driver et al., 1994). In my classroom, they took on an even greater significance as they enhanced my students' perceptions of themselves as science learners. The opportunity to engage in challenging laboratories using quality equipment approbated their ability to make sense of the world and construct viable knowledge. Allowing students to engage in inquiry-based activities deepened their intellectual confidence and proved (to many) that we were genuinely trying to teach them.

### **3.5 THE SET SMALL LEARNING COMMUNITY**

#### *3.5.1 Continuing Challenges in the SET Small Learning Community*

The improved cultural relations with my students did not automatically end misbehaviors or disruptions within the classroom field. Although students were more cooperative in my class, substantive issues with the quality of academic work, punctuality, and classroom conduct remained. In order to address these contradictions in our community we focused upon three specific components of our communal praxis.

- School Climate (and Academic Performance)
- Professional Development of the staff
- Parental Involvement

We (the teaching staff, non-teaching assistants, and our coordinator) felt that each of these areas needed to be addressed to insure continuing improvement of our learning community. Following are excerpts from our Spring 2001 Mission Statement

### 3.5.2 *SET Small Learning Community Mission Statement and Goals*

#### 3.5.2.1 School Climate and Academic Performance

High expectations for our students are exemplified in every aspect of our program. Our mission is to create a climate in which students and staff are able to teach and learn in an atmosphere that is safe, supportive, and free of distractions (SET Community Mission Statement).

Our central focus was on creating a safe and orderly school climate in which students and teachers could teach and learn. The following goals were deemed central to efforts to improve classroom climate.

- Maintain Air of Civility that presently exists
- Manage Difficult Students

Academic performance was included as part of school climate because we understood that many of the behaviors (poor attendance, low grades, resistant, oppositional behavior) that problematized teaching were the result of a lack of requisite academic skills. Thus in order to foster a positive school climate, our teachers focused on the following goals.

- Better scores on Standardized Assessments
- Better Literacy skills
- Better Mathematics skills

#### 3.5.2.2 Professional Development

The staff of the SET small learning community believes that the most effective form of staff development occurs when teachers have consistent opportunities for collaboratively examining their work. We have agreed upon both formal and informal strategies for examining our practice. We have established the following meeting times to discuss our students' work and our professional practice.

- Weekly staff meetings
- Lunch meetings several times a week
- Monthly staff dinners

In order to understand how our teaching practices could improve our students' academic achievement, we decided to regularly look at our students' as a way to improve our teaching practices. We began our weekly staff meetings by focusing on a particular student's work and identifying weaknesses in their learning. The student's teacher then identified the learning goals for the student and then discussed his/her teaching methods and form of interaction with the student. A discussion would ensue in which the other teachers commented on the teacher's instructional methods and goals for that student. The group would then discuss how each teacher could help remediate the student's learning difficulty. In this way, the teacher received input on their teaching and the students received remediation from a variety of sources. In this manner, our weekly meetings, frequent lunch meetings, and other professional development seminars helped us develop a community wide interdisciplinary approach to academic and behavioral impediments.

#### 3.5.2.3 Parent Involvement

The SET learning community is very open to parental involvement. We are committed to involving our parents in the daily functioning of our learning community. We understand that some parents do not feel a part of their children's education, but we feel that parents are integral to our work as educators. We will continue our outreach to expand our relationship with the parents of our students. Our goals for to improve parent involvement are as follows (SET Community Mission Statement).

The learning community will invite parents into the school during our Town Meetings and during classes.

- Parents are welcome whenever they wish to visit the classes
- Invite parents to join us at our Student of the Month Dinners.
- Create a monthly newsletter to inform parents of events in our community.
- We will increase efforts to bring parents in for our back to school nights and report card conferences.

### *3.5.3 Improving Classroom Climate in Our Learning Community*

In order improve the classroom climate and academic performance; we instituted the following changes in our classroom structures. It was our intention that these classroom policies would help strengthen the boundaries of our classroom fields and provide our students a learning environment wherein they could maximize their learning potential. We understood that students at times did not fully understand what cultures were appropriate for the classroom field. Following are the specific accommodations we undertook as part of our community practice. Excerpts are from our 2001-2002 SET mission statement goals.

#### *3.5.3.1 Improving Student Academic Performance*

- We have the Rubrics for the PSSA in full view in every classroom. Each teacher is emphasizing the need to improve concentration, and retention class work.
- We have focused on using the advisory time to check students' 3-ring binders for organization and to inquire about homework assignments.
- We are conducting creative classes focused around the standards. The most important piece is that we are asking students what they think; how well they have learned their subjects and what would help them.
- We are questioning them and asking how can we improve the classes so that they can concentrate and retain the information presented.
- The Academic Coach for our academic area will be coming to the science elective classroom every Thursday. She will introduce a reading program that focuses on the individual and what happens when someone reads.
- Each teacher will have a chance to work with her and the students in the science elective and English classes. The program appeals to us because of the emphasis on the Individual and what habits help or hinder reading.

- We have attempted to have mathematics year round for the 10th grade students. They have a mathematics elective, which we called pre-geometry. The same students will have geometry in the spring's semester.
- There are ACCESS Science Fellows available for this class during both semesters. Our ninth grade students have science classes and we are using mathematics during these classes. We are working to have algebra as an integral part of their science classes, thereby keeping math in front of them all year.

Successful learning could not occur if students behaved in a manner that disrupted the learning environment. Although we hoped that our array of resources would provide the resources needed to achieve academic success, many students continued to enact resistant oppositional culture that destabilized teaching | learning. Therefore, in order to maintain the “civility” of our learning environments we undertook the following procedures to address misbehavior in our classrooms

#### 3.5.3.2 Maintaining Civility in the Classroom: SET Classroom Behavior Protocol

We are trying several different approaches to providing the best classroom experience for our students. Our difficult students fall into several different categories. They feel incompetent in classes and are difficult because their skill level is so low, other students have learning disabilities, and still others have serious behavior problems. We have met with the parents/guardians of these students and are providing accommodations where appropriate. For example in the science elective class, the less skillful readers are given the chance to work in a group on the day's assignments with one of our student teachers before they begin work on the day's assignments. This gives them some support so that they don't feel so lost during the day's instruction.

The chemistry lab is denied to students who have either not done the pre-lab work or have been disruptive to the point that work in a lab would be dangerous. These students work from their texts at desks separate from the rest of the class.

We have responded to teachers complaining about disruptive students in their math classes. The disruptive students are removed from the class and sent to

another teacher with an assignment. The students sit in the back of the room and complete the work assigned.

If the students are not compliant, the other choice is to have them sit outside Room 10 in uncomfortable chairs and complete their work.

In order to include our parents we have decided that whenever a teacher makes a decision to take a student out of their instructional environment for a length of time, the parents are notified and invited to a conference. We are having the students and their parents sign an agreement specifying the behavior that must be maintained in order to rejoin and remain in their proper classes.

The structures for addressing misbehavior were a valuable resource to the teachers in our community as they established firm, reliable procedures to effectively deal with problem students. Students were (respectfully) made aware of the kinds of behaviors that were inappropriate under any circumstances (physical violence, profanity, willful destruction of classroom materials, aggressions, and willful disregard of school wide policies). Sanctions were explained and enforced: initial infractions would occasion a conversation with the coordinator and teacher involved in order to reach a resolution of the incident. The discussion provided an opportunity to communicate our reasoning for our community wide behavior policies. Misbehaviors that were more serious resulted in a mandatory parent conference. In many instances these discussions would occasion modifications in policies, thus students felt a modicum of contribution to the structure of the community.

Involving parents, students, and school staff in conversations that discussed the misbehavior helped us teach (as a community) our students why their behaviors were inappropriate to the classroom field. More importantly allowing our students a voice during these discussions communicated our position that they were co participants in the success of their learning. As the culture of our community improved, the use of these resources would become more infrequent, however our use of conversation and negotiation would remain as the principal methods through which we maintained the civility in our classrooms.

### **3.6 A CONVERSATION WITH CLARE STICKNEY THE SET SMALL LEARNING COMMUNITY COORDINATOR**

The coordinator of our learning community was essential to our efforts to build a transformative teaching | learning environment. As our administrator, she coordinated the efforts of the SET teaching staff, pre-service student teachers, university researchers, and community partners. She also dealt with our most problematic students, scheduled parent conferences, and handled all situations that might interfere with our teaching. Her voice is included in this thesis as she was my direct supervisor and supportive colleague during my time in City High school.

Stickney began teaching in City High in 1993, and worked with four of the school's five administrations: she became coordinator of the SET community in 1989. I interviewed her on two occasions (Stickney, 2008) and (Stickney 2010), as her experiences as teacher and administrator, gave her a unique perspective on efforts to improve the quality of teaching and learning in our school. Given her history, I was curious to know how she viewed our efforts during the 2000-2001 school year. Had we in fact marshaled our many resources in ways that provided transformative learning opportunity to our students? Were our interactions different from those in prior years? Following are excerpts of our second interview conducted on October 22, 2008.

Cristobal

What do you think were the most important considerations that guided our work as teachers in our learning community?

Clare

I think that we as a community looked at our kids and realized they had not been served well and decided we wanted to do something so that the kids knew that we thought they could genuinely be educated and we were there to do it. I think the kids bought into this and the teachers did too. I think it was fortunate that we were all together because you, me, and a certain number of the school staff looked out at our kids and felt we could do more for them. I think that intuitively I had a definite idea of what I wanted to do, and you did too. Working with Ken

brought in another level because the intuitive was married to theory so we could discuss what was happening from the practical and the theoretical points of view. We had a lot of different people working with our kids, but I think the ones that worked the best with us genuinely liked the kids (even the ones that were really a pain... (but that's how kids are sometimes)).

Stickney is referring to the history of African American children in the Philadelphia School System. She was a member of this school's staff during its most troubled years, and she has seen how the political concerns of the city have contributed to the poor educational opportunity offered to children in this school. Her statements that the "kids have not been served well" and "we felt we could do more for them" refer to this history. Her comment that "we thought they could genuinely be educated and we were there to do it", describes the spirit of our interactions with our students. It is important to note two important components of our work in this community. First, the educators in the community were able to exercise their agency to make changes in their curriculum: this is what Stickney means when she says we "intuitively knew what we wanted to do." Secondly, our work with Ken (Dr. Kenneth Tobin), informed those decisions with pertinent, relevant educational theory. The interplay of our professional "intuition" and theory, combined with our desire to "genuinely educate" our students, summarizes the work of the SET teaching community. The notion of a "genuine education" references Stickney's feeling that our students have not received the kinds of intellectual skills and knowledge that will prepare them to have successful lives in society. I asked her to elaborate how she felt our children were underserved.

Cristobal:

You said our students have not been well served. How has this has happened?

Clare:

I am really bothered by this, but the truth is that our kids have been terribly underserved by this school system. Many students in this system have not been taught; people have simply passed them on. I think it's a disgrace, that you can find any number of high school graduates with diplomas and the best that they did was sit in the back of the room and be quiet. These kids did worksheets,

watched movies, but they did not learn any substance in the subjects they learned. They certainly haven't had any real science or math. I think that is why many kids don't respect their teachers.

Stickney is alluding to the reality that many of our students have not been provided the intellectual skills needed to become successful citizens of our society. They have not been provided the knowledge needed to break cycles that will reproduce their marginalized socioeconomic status. This lack of requisite skills is what Stickney refers to as being "underserved." Teachers are disrespected in because of their complicity in a system that fails to educate its students.

A text many of us in the DUS had read was *The Pedagogy of Poverty*, (Haberman, 1991). The article analyzes a suite of teaching practices that are pervasive in urban education. The underlying goal of these practices is on maintaining classroom order and compliance with administrative curriculum mandates. The pedagogy is founded on the belief that quiet well managed classroom wherein students complete structured learning tasks to improve their basic skills will improve achievement on standardized assessments. The enforced curriculum mandates and fixation on improved test scores has forced many teachers to adopt these practices in order to control their students and manage their classrooms. As a result, simple, unchallenging teacher directed activities, such as copying out of books, or completing worksheets are the types of activities that have become pervasive in urban schools. The reality is that such a focus on basic skills and classroom management fails to provide students the intellectual skills needed to become successful productive learners. These are the students that Stickney refers to as being "passed over": they are the graduates who failed to learn anything of substance while in school.

An unfortunate consequence of this pedagogy is that students become accustomed to completing undemanding unchallenging learning activities. Many will quietly and efficiently complete undemanding learning tasks, but will resist efforts to engage them in rigorous learning activities that demand active participation. Hagerman (1991) notes that teachers who seek to involve students in genuine learning will experience "bedlam

and apathy” while those “who announce take out your dictionaries and start copying the words that begin with ‘h’ are rewarded with compliance and silence” (p. 292). I experienced this in my first months at this school, when my science activities were chaotic, disorienting failures, while the rote learning of book work met with easy compliance. The students were “content” to sit quietly and complete their work and I was “in control” of the class. Unfortunately, they did not learn little that genuinely challenged them intellectually, nor did they learn science in a meaningful manner. These students preferred this type of learning in lieu of activities that required their active participation. If challenged they became unruly, diffident and destabilized the learning environment. Given the difficulties I had faced in the first months, I too had opted for this more “manageable” pedagogy. I was curious as to why these students preferred this type of learning experience.

Cristobal

Why do you think some kids choose to sit quietly in the back of the room and be passed over? Don’t they want to learn? Is that why you think some kids act out and seem to disrespect their teachers?

Clare

I think when we talk about respect in our research; it takes on a very different connotation. I do believe that many teachers don’t learn their kids names, I mean it could be January and they’d call them either by a name that wasn’t theirs or terribly mispronounce their names, that makes many kids feel disrespected. And then there would be all kinds of problems if there was talking (even if you weren’t the one talking or not) ...so I think the kids who sort of sat in the back of the room took the worksheets that they were given, completed them the best that they could and then turned them in and then went home and didn’t want to deal with the teacher making fun of them, or being sarcastic or hollering at them; and the kids that were problematic were the ones who could defend themselves and best the teacher, and make them look foolish. However, I do not think teachers are served well either because you never had people that would walk into the room and give teachers the support they needed, to change the system so that kids could really learn.

Stickney's response reaffirms the centrality of respect in our interactions with our students. From the early research efforts by (Seiler, Tobin, Walls, 2000), respect had been identified as an essential component of successful interactions with students. The discordant, confrontational nature of my classroom began to change after our first cogenerative dialogue in which we were able to respectfully communicate our differences and negotiate changes to the classroom environment. That conversation established a mutual respect, which remained as part of our improved learning environment. As noted in the introduction, mutual respect is foundational to successful learning environments because it facilitates the communication | negotiation across the boundaries of difference that exist in urban classrooms. The kinds of disrespectful interactions Stickney mentions are examples of the symbolic violence (Bourdieu, 1992) that often occurs when teachers fail to honor | respect their student's cultural perspectives. It is important to note that respect must be mutual thus students also need to honor | respect the teachers' cultural perspectives. This cultural alignment takes time (Tobin, 2006) and requires a supportive environment in which teachers and students can build respect and trust. Stickney is correct to note that teachers are not enabled by the current system because they are not offered the resources needed to establish trusting respectful relationships with students. Her efforts in SET were unique; as she understood the importance of providing teachers the resources, they needed to fully exercise their agency. In this regard, she was indispensable to my successful enculturation.

Cristobal

I fully agree. There were many times that you supported me in the fall of 2000 when I had so many difficulties with my ninth grade class. You understood how difficult those kids were and you were always willing to take them into your office. Like when I had that mass class exodus from my class, you listened carefully to the details of the event and helped broker a solution.

Clare

Yes, I think it's important to let teachers know that I was there to support them. That's why I considered it my responsibility to put into place little procedures that would support our teachers, where kids couldn't just misbehave in a class or walk in and out of classrooms. Whenever kids were sent to my office, I would talk with them to figure out the problem, and then I would sit them outside my office (with work) and get with the parents right away to get them to come around and help us. We had to deal with kids who were problematic quickly so teachers could get on with instruction.

I think we sometimes pay too much attention to the kids that are not behaving well and forget the ones that are trying to learn. But this is why I think we did so well with our kids because we knew our goals well and we knew our focus. We knew where our focus should be. And it wasn't necessarily on "administrivia" it was on understanding that we all had different responsibilities to take care of so that kids were served and teachers felt like they were making progress. All of us had a contribution to make "for the good of the order."

Stickney's use of the term "administrivia" refers to the vast assortment of administrative tasks (teachers and administrators in urban schools) are required to complete. The documents are all meant to show compliance with mandated curricular and pedagogical practices (informed by deficit perspectives) that many believe will insure improved performance on standardized high stakes testing. Completion of these required administrative tasks is "trivial" because they are only meant to document compliance but do little to create transformative learning environments that maximize our student's learning potential. Rather these policies constrain teacher agency and perpetuate existing sociocultural realities that have historically disprivileged urban students. Stickney is correct that our community of teachers "knew our goals and our focus" as we had a clear understanding of the learning needs of our students. More importantly, she (and Principal Johnson) created structures that enabled the agency of all participants (students teachers co teacher, and researchers) in our learning community. Thus, we were all able to exercise agency.

Cristobal

I think that is what we had was a perfect combination of resources... first of all a like you mentioned, was genuinely liking the kids. That is something that is often assumed. So, first of all we really liked the kids (even the ones that were difficult), but then we had a combination of many resources. It couldn't have happened without you as the administrator, it couldn't have happened without Ken and the intellectual resources, it couldn't have happened without the extra bodies, it couldn't have happened without Florence. I mean we had the perfect combination of resources to do all that we did so that the kids could be served, I think that if any of those resources is missing then kids stop being served: without any of those things we couldn't have made any of the progress we made. And even with the resources we had, it took a long time to convince these kids that we were really interested in them, because they were so used to the way things have been for such a long time, but once we turned the corner and convinced them we were on their side, then we could handle even the most difficult kids in the school

Clare

Yes and that comes about when you really trust your kids and treat them like you would your own child. That at some point you have to...that's what I loved about Florence, she said we have to trust these kids, we have to give them the idea that they are worth something, that they can be part of this world, because we trust them. We have to give them that faith...that we trust them and that we all that we are doing is about their education. I think that is what we all understood, we all understood that no matter what we did we had the responsibility to make them understand that we were trying to shape them into being productive people.

Although the year began with many strident, acrimonious confrontations, relationships with our students improved considerably by year's end. As the months progressed our efforts on our students' behalf, communicated a genuine belief in their learning potential and our earnest desire to positively affect their lives. Stickney recalls that it was

Florence (Principal Johnson) who said that we have to trust our students and “give them the idea that they are worth something, that they can be part of this world.” Her comment that you “have to really trust your kids and treat them like you would your own child” aptly describes the nature of our interactions with our students. It is important to note that both Stickney and Principal Johnson position trust as the essential component of successful interactions with urban students. Their comments reaffirm my belief that trust and mutual respect are foundational to transformative learning environments. As our students began to trust us, the negative behaviors, resistance, and oppositional culture abated and a more positive and cooperative atmosphere emerged. The increasingly positive emotional energy and solidarity allowed us to use our many resources to structure engaging, challenging learning activities. As noted earlier in this chapter, these activities provided students the opportunity to use their symbolic and cultural capital to learn science in ways that were personally meaningful, relevant, and transformative in they’re lives.

### **3.7 STRUCTURES WITHIN A TRANSFORMING LEARNING ENVIRONMENT**

#### *3.7.1 Emerging Understandings: 2000 -2001*

A central question this thesis seeks to answer is how to structure learning environments that maximize the learning potential of urban students. Though the start of the 2000-2001 school year was a discordant, unsuccessful time in the SET community, structural changes made during the year initiated a gradual transformation of the learning environment. As the year progressed, more focused engagement in our classrooms, improving academic achievement, and a noticeable decrease in disruptive behavior, suggested that we had provided students the structural resources needed to maximize their learning potential. The improvement in behavior and classroom climate indicated that the policies that addressed institutional concerns (attendance, behavior, academic achievement, compliance with school policies, etc) had helped resolve the meso level contradictions that constrained student learning.

It is important to note that while we placed great emphasis on the mesoscopic components of our community, our overall approach to teaching | learning was guided

by our sociocultural perspectives that theorized all activity as a form of cultural production. Thus while we worked to address instances of misbehavior, or resistant oppositional culture, we also sought to understand our students' cultural perspectives and the impact of those perspectives on social interactions within our community.

### *3.7.2 Sociocultural Perspectives*

Our growing understanding of our student's cultural perspectives allowed us to view circumstances of resistant or oppositional behaviors as the result of a misalignment between the various cultural perspectives that converged within our classrooms. This allowed us to approach instances of misbehavior as an opportunity to discuss our differing perspectives and reach a resolution that respected all participants in the classroom field. Our deep respect for our students' ways of being was informed by our awareness of the socioeconomic and sociopolitical conditions of the neighborhoods of West Philadelphia and how the culture that evolved in those communities differed in many respects from the mainstream cultural themes that informed the school community and that of our own cultural narratives. These understandings provided the insights needed to genuinely respect our students' actions and (more importantly) helped us negotiate resolutions to contradictions in the classroom field. The central method was discussion with all participants (including parents) as conversation was (and remains) the most important method of bridging the boundaries of difference that populate the fields within urban schools. Cogenerative dialogues were instrumental in this process as they provided participants a structured forum in which to discuss contradictions in the classroom. Although the most instances of resistant or oppositional behavior were resolved through dialogue, many events necessitated a more direct response as they could not (initially) be resolved through dialogue. In these instances, our community's institutional policies provided the mechanisms to address these incidents.

### *3.7.3 Mesoscopic Concerns*

Three institutional components of our community's structure: School Climate, Academic Performance, Professional Development of Teaching Staff, and Parental Involvement helped address the mesoscopic concerns that are essential to rigorous learning environments. As noted in the conversation with the coordinator, these

structures helped communicate our commitment to a quality education and our genuine desire to help our students become successful young adults. Our interdisciplinary approach to teaching helped articulate our beliefs in each of our classrooms, thus ensuring a communal approach to school climate and academic achievement. This common approach to school climate helped establish firm boundaries to our classroom fields and helped our students understand the kinds of behaviors that were detrimental to teaching | learning. Our effort to include parents in the management of our community was an attempt to bridge the historical divide that existed between the school and the neighborhoods of West Philadelphia. Including parents in the resolution of contradictions in our learning community closed this cultural gap and affirmed their position as equal co-participants in the education of their children. Including parents in our community also provided teachers an opportunity to interact socially with members of our school community and in so doing more fully understand the cultural codes that informed our students' social practices. Our respectful interactions with our students and their parents created many trusting, mutually respectful relations that established the foundation of our transforming learning community. The resulting positive emotional energies fostered solidarity with the culture of the school community as evidenced by the improvements in behavior, attendance, and classroom engagement.

#### *3.7.4 Human and Material Resources*

The transformation of our community was also facilitated by the infusion of a wide array of resources provided by our community partners and local universities. Of the many resources that facilitated the improved structure of our learning community, coteachers were the critical structures that enabled the agency of all participants in our classrooms. The presence of coteachers provided the classroom teachers the time to work closely with their students and provide them the individual learning support they needed. Working closely together gave teachers and students the opportunity to become familiar with each other and in so doing build trust and respect for one another. As our cultural relations improved, the incursions of resistant oppositional culture lessened and we were able to focus more of our energies on the teaching | learning of science.

### *3.7.5 Components of a Transformative Learning Environment*

Our strong emphasis on the institutional components of the learning environment informed by critical sociocultural perspectives on teaching | learning created the conditions that helped improve the quality of social interactions and engagement in the SET small learning community. The infusion of requisite material resources and coteachers provided additional structures that helped build learning activities that maximized the learning potential of our students. These structures remain as essential components of transformative learning environments.

## **3.8 COMPONENTS OF MY SUCCESSFUL ENCULTURATION**

### *3.8.1 Cultural Alignment*

The start of the year was a disorienting, strident period of time, which forced me to analyze my beliefs about the teaching of science, its relevance to the lives of my students and of myself as educator. Though I had assumed that my life history and experience in other urban settings would have prepared me to teach in this community, I quickly discovered that I knew little about the culture of the students in my science classrooms. The acrimonious confrontations occurred because neither my students nor I had the cultural resources to communicate across the many boundaries of difference that separated us one from the other. Our inability to communicate | negotiate across difference occasioned discord that marred my first months at the school. Not until we were able to engage in conversations that helped us understand the perspectives and motivations of the other did we begin to bridge the cultural divide separating us.

### *3.8.2 Theoretical Perspectives*

My understanding of the cultural implications of the problems in my classroom emerged from my readings of research literature informed by sociocultural perspectives. Although I could have employed deficit perspectives to explain the discordant atmosphere in my classroom the findings of the research studies (Tobin, Seiler, & Walls, 1999) and (Seiler, Tobin, & Sokolic, 2001), suggested a more complex social, cultural, and historical analysis of the interactions between my students and me. Most surprisingly, these readings implicated my own cultural narrative as a variable in the situation. Once I understood the role that I as teacher play in all interactions within my

classroom field, I became able to engage in dialogues that communicated a deep respect and willingness to negotiate the structures within my classroom. These research papers provided the theoretical insights that facilitated my successful enculturation into City High school community.

### *3.8.3 A Collaborative Teaching / Learning – Research Community*

During the summer of 2001, I became a member of the Discovering Urban Science research group. The group led by Dr. Kenneth Tobin, was composed of fellow science teachers from throughout Philadelphia, my administrator, graduate students and researchers from various local universities. Although the work of the research program began officially in the fall of 2001, its effects were already felt in our school as two university researchers had been in residence since 1999. The findings from their research had already occasioned profound changes in my understanding of culture and its affect on social interactions in my classroom. My work as teacher – researcher in the DUS provided the critical perspectives that informed and guided my ongoing development as urban educator. The following chapter is a published literature review of the work of the Discovering Urban Science research group.

CHAPTER FOUR  
THE DISCOVERING URBAN SCIENCE RESEARCH GROUP  
EVOLUTION OF AN URBAN RESEARCH PROGRAM

**4.1 THEORY RESEARCH AND THE EVOLUTION OF PRAXIS**

Our development as educators depends on a critical and nuanced analysis of the contradictions in our daily praxis. The analysis however, must be guided by pertinent educational theory and research because solutions to classroom problems always yield both coherence and new contradictions (Sewell, 1999). Theory and research are indispensable components of praxis because they provide both the methodology to analyze our teaching practices and the theoretical perspectives needed to guide future pedagogical decisions. Martin (2005) notes

That [the] recursive relationship between practice, theory, and research provides a means for local transformation of structures and practices as findings from research / theory continually inform the practices of participants and vice versa (p. 31).

Pedagogical decisions informed solely by a practical analysis of classroom realities are often underpowered because our life histories and cultural assumptions will limit our ability to critically analyze the hidden contradictions in our praxis. At these times, it is our reflection on relevant educational theory and our engagement with fellow teacher-researchers that provides the perspectives needed to transform structures that impede our continuing development. Upon my arrival to City High, I encountered classroom realities that frustrated my attempts to teach a challenging inquiry based science curriculum. Although I was an experienced teacher, I found myself unable to ameliorate the ever-worsening conditions. My introduction to the literature on social reproduction and resistance theory and my reading of the work of critical African American cultural sociologists provided the theoretical perspectives that initiated my successful enculturation into my new community of practice. Fortunately, these initial readings were the beginning of my association with fellow educator researchers in Philadelphia. The following chapter documents the research literature of the Discovering Urban

Science research group and effects of that the body of research on my development as an urban educator.

#### *4.1.1 A Time of Unsettled Life:*

The first year of my teaching at City High, was a time of transition and transformation which Swidler (1986) characterizes as a time of “unsettled life”: a period in a person’s life when cultural assumptions break down and necessitate the formation of new strategies of action. During the first months of the year, my conceptions of authority, the distribution and exercise of power, and the rationale for science education were seriously challenged. Suspensions, classroom altercations, the destruction and loss of private property became such common everyday occurrences that I doubted that I would ever be able to teach in my new urban environment. I had assumed that my race (I am a Black person) and my personal history (I have lived in the inner city all of my adult life) would facilitate my transition into this new teaching environment, but my students’ rejection of me and my science curriculum suggested that these aspects of my persona were but superficial similarities. Although I struggled mightily to find solutions to the daily problems, there was little in my personal or professional history that helped me address the divide that existed between my students and me. The discord in my classroom continued until I was introduced to research reports of two studies undertaken in another learning community in City High school.

#### *4.1.2 Emerging Understandings*

The research papers *Reproduction of Social Class in the Teaching and Learning of Science in Urban High Schools* (Tobin, Seiler, & Walls, 1999) and *Design, Technology, and Science: Sites for Learning, Resistance, and Social Reproduction in Urban Schools* (Seiler, Tobin, & Sokolic, 2001) detailed efforts by university researchers and school faculty to introduce inquiry based science curriculum to students in the Opportunity small learning community of City High school. The researchers used resistance and reproduction theory in conjunction with the literature on African American anthropology to guide their analysis of the effects of classroom interactions and institutional structures on the teaching and learning of science. Neither of the research efforts proved successful as students refused to engage in the learning activities and

rejected researcher attempts to create transformative learning environments. The analysis of student behavior was framed within a sociocultural perspective that suggested that the contradictions that constrained the learning of science in their learning community (and in my classroom) were the result of the clash of conflicting cultural orientations. The theories that informed these papers helped me bridge the cultural divide separating my students and me. Subsequent readings provided additional insights on authority and power that facilitated my ongoing enculturation and the development of my identity as an urban educator. The impact of these research papers upon my practice reaffirms the importance of theory in the ongoing development of the teacher's professional practice.

Although the writing of these papers predates the start of the DUS, I include them in this review as they form the theoretical foundation of my development as urban educator. The ensuing years of research by members of the DUS is presented here as it forms the theoretical background to my continued growth as educator. Each of the articles presents a theoretical perspective that either challenged, informed, or redirected praxis. Some of the research was undertaken in other learning communities in the school, three papers were written in my class, while other research was undertaken in schools throughout Philadelphia.

#### **4.2 THE DISCOVERING URBAN SCIENCE RESEARCH GROUP**

The DUS research group was convened by Dr. Kenneth Tobin of the University Pennsylvania in the late Fall of 2001 as part of an NSF research grant. It brought experienced teachers, student teachers, students, university faculty, and doctoral students together on a weekly basis to discuss relevant science education research and assess issues within our schools and science classrooms. Each week's seminar was devoted to discussion and analysis of classroom events in light of existing theory or (as was often the case) a member would introduce a new theoretical perspective that challenged existing practices and beliefs. The weekly seminars provided a forum in which we could use our ongoing research efforts to analyze contradictions within our school, our classroom or within the enacted science curriculum. The members of the group would all agree that

our participation in conversations in the field of the weekly DUS seminar meetings [enabled] us to (little by little) gain the dispositions we needed to continue to critically co-reflect on our practices in our individual classrooms” (Martin, 2005, p. 125).

Throughout our five years of weekly seminars, theory and praxis existed in a recursive dialectical relationship that allowed both our theoretical perspectives and classroom practices to continually evolve and support our growth as educators. It is important to note that although some theories became outdated and were supplanted by new ideas, the following three perspectives have remained as foundation to the work of the DUS.

- Sociocultural Perspectives on the learning and teaching of science;
- A critical ethnographic perspective on our praxis as researchers and educators
- A commitment to the authenticity criteria (Guba & Lincoln, 1989) as components of qualitative research

It should be noted that although a given text may not mention these perspectives directly, all of the researchers pay attention to the salience of social interactions, the centrality of culture and an awareness of the socio-political implications of educational research and our responsibility to affect positive change in the lives of our students.

#### *4.2.1 Sociocultural Perspectives*

A sociocultural perspective suggests that human activities such as teaching and learning are social activities mediated and informed by culture. Educational research should therefore focus on the intersection of social interactions and culture (Lemke, 2001). Culture can be defined as the system of norms, conventions, symbols, rules, and meanings (semiotic dimensions) that inform and structure social practice. Culturally appropriate practices evolve over time as a result of the dialectical interrelation between the semiotic and the practical dimensions of culture. A sociocultural perspective views the learning of science as an enculturation into the culture of science with its particular semiotic patterns (its discourse) and culturally appropriate discursive practices (Lemke, 1990). Enculturation into the community of science would occur as students accessed relevant culture and enacted culturally appropriate practices that define meaningful actions within the scientific community. Thus, “in a community that is learning science, one might expect to see students engage in ways such that the discourse of a class would

become more science like over time” (Tobin, 1998, p. 192). Cultures however, represent worldviews that bind members of given communities together as they engage in activities that further the economic, social and political goals of their community. This pursuit has historically produced domination of some groups by others as the cultural texts (the Discourse) of the dominant culture privileges their worldview and marginalizes others (Fairclough, 1992). Social, political, and economic power accrues from the hegemony of dominant Discourses and society becomes stratified according to social class and economic status. This reality poses distinct problems for students in large comprehensive schools such as City High where approximately (98–99%) are African American living in communities that are historically characterized as economically deprived. Their history, cultural dispositions, and socio-economic status position these students as members of a marginalized urban “underclass” which differs in most respects from that of the dominant white American middle class, the cultural values of their school and the cultural identities of most of the members of their teaching staff. Understanding these realities and the tendency for social and cultural reproduction of marginalized socioeconomic status in our society, (we) the DUS research group adopted critical perspectives as the guiding methodology of our research efforts.

#### *4.2.2 Critical Ethnographic Method*

The research at City High School emerged as a response to the realization that material and human conditions in large comprehensive urban high schools (such as City High School) fail to provide students with the level of education they need to become fully engaged and successful citizens of modern American society (Tobin, Seiler, & Walls, 1999). Many educators feel an education that is not a transformative force in the lives of marginalized students contributes to the reproduction of their low socioeconomic status and limits their life possibilities. Critical ethnographic methods seek to document and “bring to the forefront the role of schema and practices associated with traditional hegemonic teaching and learning structures which serve to perpetuate oppressive cycles of reproduction” (Martin, 2005, p. 18).

#### *4.2.3 Authenticity Criteria*

Critical perspective however, demand that research foster positive change in the lives all

participants within the research environments. As such, the DUS research program adheres to the authenticity criteria (Guba & Lincoln, 1989), which function to ensure that qualitative research does more than report and document given realities. These criteria demand that research participants increase their understanding of the environment they inhabit (ontological authenticity); become more aware of the beliefs of others in their environment (educative authenticity); and that the research empower (tactical authenticity) and urge the participants to action (catalytic authenticity). Adherence to these criteria is vital to each of the research efforts because each unfolds in a situation where the future success of very talented but marginalized students is at stake. In every instance, the research was committed to resolving institutional problems, promoting new pedagogical practices, or creating new science curricula that would permit “all learners of science to attain the highest possible standards to equip them for productive lives in the communities in which they reside and live their lives” (Tobin, Seiler, & Walls, 1999, p. 171).

### **4.3 RESEARCH LITERATURE OF THE DUS**

#### *4.3.1 Reproduction of Social Class in the Teaching and Learning of Science in Urban High Schools*

Two university researchers who taught a ten-week chemistry unit in a small learning community known as Opportunity led this initial research effort. Students were assigned to this community because of extremely poor behavior, very low grades, or chronic truancy: as a result, students in “opt” were stigmatized as unintelligent, un-teachable and unwilling to learn: teacher expectation was therefore extremely low and the curriculum offered was neither rigorous or intellectually stimulating. In response to these conditions, the researchers created a ten-week chemistry curriculum that attempted to engage the students in hands on inquiry based activities designed to capitalize on their interests. Unfortunately, the research effort proved unsuccessful, as student resistance created a barrier that precluded any genuine engagement with the curriculum. Student interviews suggested that the resistance was a response to contradictions within the learning environment:

A tension exists between the students primary discourse acquired in the home and peer group and the discourse of science class. Though educationally and economically disabling, the rebellion and resistance demonstrated by the students in Opportunity could also be viewed as a potential site for creative, discursive agency (Tobin, Seiler, & Walls, 1999, p. 185).

It is instructive to note that what seemed initially to be resistance was the manifestation of contradictions that arose when students attempted to use new discursive strategies in their learning activities. The subsequent research (situated in the same community), focused on this contradiction between students' primary discourse and their emerging use of the discursive practices of the classroom scientific community.

The first two articles of this review are evidence the recursive relationship between theory and practice as the contradictions within one study foster the evolution of new theories that guide subsequent classroom practice and promote ongoing research. The reader will note that the social reproduction theory that informs (Tobin, Seiler, & Walls, 1999), responds to insights as to the nature of resistance and evolves to suggest a more nuanced investigation of students' discursive practices and cultural production informed by perspectives on African American anthropology. This review of the literature of the DUS, highlights this inter connectivity between research studies so as to outline and trace the evolution of the theoretical base of the DUS.

#### *4.3.2 Design, Technology, and Science: Sites for Learning, Resistance, and Social Reproduction in Urban Schools*

This research would focus on students' development of secondary discursive practices of the scientific community while engaged in a project to design and build toy-model racing cars. It was hoped that the nature of the classroom activities would prove highly motivational and encourage students to use their primary discursive practices to analyze and improve the performance of their racing cars. The analysis and redesign processes would create a field where students' primary discourse would reflect practices associated with scientific discourse thus providing a "border crossing" between the two cultures. Initial student response to the learning unit was very enthusiastic and suggested that the activities of design and constructing the toy cars would provide the motivation to engage in a deeper investigation of motion. However, "after the first day's

enthusiasm, students exhibited minimal interest in racing and modifying their designs”, and although the teachers used a variety of prompts and enticements, “repeated attempts to encourage students to move beyond the superficial level of playing and building their cars went unanswered” (Seiler, Tobin, & Sokolic, 2001, p. 752). Students failed to adopt secondary discursive practices as they refused to engage in the analysis and redesign of their model cars.

Resistance in this study was not a reaction to institutional policy (as in the prior research), rather students were not interested in the classroom activities because they were actively involved in the pursuit of their own goals and the creation of social capital in a cultural field informed by the “Code of the Street.” Anderson has defined the Code as a “set of rules governing public interpersonal behaviors, especially violence” (Anderson, 1999, p. 33). The code thus defines cultural practice in the culture of the streets, where “respect” is the most valuable “currency.” Given that the students’ home communities are rife with violence and are relegated to the edges of society, Anderson suggest that the code is actually “a cultural adaptation to a profound lack of faith in the police and the judicial system—and in others who would champion one’s personal security” (p. 34). Self-respect (and the social capital it garners) provides the security and personal safety needed to navigate hostile and dangerous streets of Philadelphia.

This text proved instructive as it detailed the kinds of activities, (brash, harsh talk, the possibility of violence, the use of signifying clothing, music, that students (mostly male) would exhibit as they pursued their campaign to garner respect. More importantly, it detailed the kinds of behaviors that communicated disrespect on our part; i.e. (extended eye contact, invasion of private space, or singling out students by name),

Our knowledge of student cultures and cultural production would be informed by the writings of other African American anthropologists such as Wade Boykin’s (1986) *The Triple Quandary and the Schooling of the African American Children*, John Ogbu’s (1992a) *Understanding Cultural Diversity and Learning*, Jay MacLeod (1995) *Ain’t No Makin’ it: Leveled Aspirations in a Low-income Neighborhood* and Lisa Delpit’s (1988) *The Silenced Dialogue: Teaching Other People’s Children*. The literature suggested that

student actions were informed by cultural symbols and practices informed by their socializations at home and in the streets of their communities. These cultural codes are triggered by contradictions in the classroom field, or in response to cultural imperatives such as the campaign for self-respect: they function as powerful constraints on classroom behavior. Sewell (1999) tells us that cultures are thinly coherent, contested and are enacted in fields with weak, porous boundaries. Thus, cultural dispositions associated with other fields can easily invade and compete with the culture of the science classroom. Successful teaching can occur when the differing cultures agree on and pursue common goals: when this is not the case, contradictions arise as students pursue goals that will garner them the greatest amount of social capital.

Whereas it seemed plausible to conceptualize student behavior as the results of the campaign for self-respect, other events suggested that closer attention to student interests and a more concerted effort to include their cultural resources in the design of curricula might provide the continuity between student culture and that of the science classroom. Gale Seiler's research undertaken in the spring of 2001 provided an opportunity to explore the use of student interest to structure curriculum.

#### *4.3.3 Understanding Social Reproduction: The Recursive Nature of Coherence and Contradiction within a Science Class*

Seiler's research attempted to create a science curriculum that would "[address] students' culture and lived experiences in the context of science and [allow them] to guide their own curriculum" (Seiler, 2002, p. 4). The methodology of this thesis research was informed by a critical ethnographic perspective (Barton, 2001) and employed new concepts from cultural sociology to articulate how schools contribute to social and cultural reproduction through the differential valuation of habitus and cultural capital.

Cultural capital can be defined as the sets of linguistic and cultural competencies that individuals inherit by way of the class located boundaries of their families" (Giroux, 1981, p. 8). Habitus is "a system of lasting transposable dispositions which, integrating past experiences, functions at every moment as a matrix of perceptions, appreciations,

and actions” (Bourdieu 1977, p. 83). Habitus is “one’s sense of “how to play the game,” while cultural capital is comprised of all the tools one has to “play the game.” Both are informed by one’s primary socialization and given the stratification that exists in society, people can become “constrained by their habitus and confined to their original class, economic, and social positions (Seiler, 2002, p. 12). Societal constraints coupled with a person’s unconscious use of cultural resources (habitus and cultural capital) create the forces that reproduce economic class and social position (Willis, 1977).

Cultural reproduction and symbolic violence occur because modern societies privilege the cultural capital and habitus of members of dominant cultures and devalue the cultural production of minority populations. Educational institutions contribute to these processes because they represent and promote the cultural capital of the dominant social classes, while marginalizing that of minority student cultures. Although Bourdieu’s concepts were useful descriptors of the processes of cultural and social reproduction, they failed to provide a theoretic of how social transformation occurs.

Sewell (1992) defines structure, as “sets of mutually sustaining schemas and resources that empower and constrain social action” (p. 19) and “agency as the ability to control, transpose, or transform structures. Agency however is “implied by the existence of structure[s]” (p. 20), whereas structure is “dynamic” and the “continually evolving outcome and matrix of a process of a social interaction” thus structure and agency form “the dialectical interaction through which [we] shape [our] history” (p. 27). The understanding of the role of structure in determining student agency would remain as part of every subsequent study of the DUS.

At the start of her study, Seiler noted the policies and curriculum in the SET learning community disadvantaged students and contributed to the reproduction of marginalized status. Thus, the goal of her study was to alter social structures and student participation so as to foster transformative change in the curriculum and in the learning community. Boys were given the opportunity to participate in a “lunch time science club where they determined the curricular focus of each class, or they were allowed to guide the curriculum of a specified science course within the “Science Elective Class.” It was

hoped that such student involvement would help create opportunities for students to create a transformative and engaging science curriculum.

Although students were given multiple opportunities to propose curriculum or teaching strategies, they did not participate in the curriculum in ways that suggested increased agency or transformative engagement with science. Thin coherence between the cultures within the science class and the porous boundaries of the classroom field allowed strategies of action informed by the streets and the campaign for self-respect to dominate the classroom discourse. The contradictions that triggered the enactment of street culture did not exist within any one field, but emerged from contradictions within the various fields that intersected in the science classroom. Understanding the nested relationship of the fields students inhabit suggested the need for the creation of “a stronger, less porous [school] culture [that would] trigger productive student participation over street behavior” (Seiler, 2002, p. 168).

Seiler (2002) cautions us against a simplistic analysis of the relationship between contradictions, habitus, and student actions and suggests that it is difficult to determine how students interpret events and how or why those events trigger given strategies of action. She comments on this “complexity” by citing Bourdieu and Wacquant (1992), “Human action is not an instantaneous reaction to immediate stimuli, and the slightest ‘reaction’ of an individual to another is pregnant with the whole history of these persons and of their relationship” (p. 124). Thus to fully understand the nature of contradictions, and why given events trigger habitus, necessitates an attention to the historical as well as the cultural context of the interactions between participants in a given field.

This suite of papers predated the official start of the DUS, and provided a transition from resistance theory (Tobin, Seiler, & Walls, 1999) and reproduction theory (Seiler, Tobin, & Sokolic, 2001) to a theoretic more fully informed by a cultural sociological perspective. Seiler’s dissertation also used reproduction theory to analyze the reproduction of marginalized status but she introduced the structure | agency dialectic as a methodology to address how to afford urban youth transformative learning opportunity. Most salient in Seiler’s work was the use of student interest to organize the

science curriculum. Her successful use of student interests as a basis of the science curriculum, would inform my research on how to improve student engagement and participation in the science laboratory. Seiler's research helped us conceptualize the dialectical relationship between structure (human, material, and symbolic resources) and student agency. Understanding that structures are produced, reproduced or transformed by agency, at the same time that structures enable / constrain agency radically changed the manner in which I perceived the many resources in my science classroom.

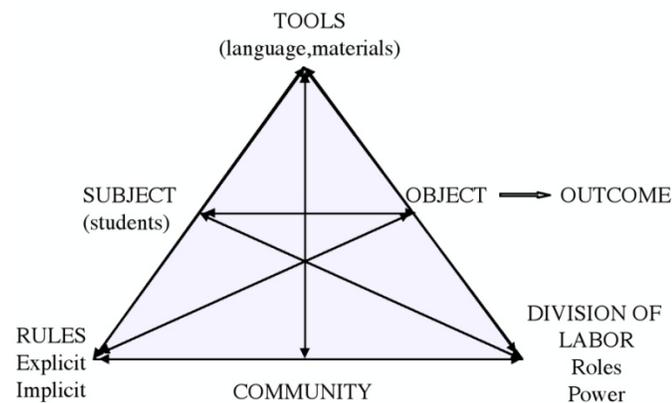
The research by (Roth W. -M., Tobin, Elmesky, Carambo, McKnight, & Beers, 2002), *Re / Making Identities in the Praxis of Urban Schooling: A Cultural Historical Perspective*, expanded our understanding of structure | agency dialectic as it used Cultural Historical Activity Theory to analyze contradictions (and coherences) in given social fields. The research was most provocative as it suggested the inclusion of historical perspectives and the subjective affective dimensions as structures in the science classroom. The researchers introduced cogenerative dialogues as a way to include our student's voice in the resolution of contradictions in the learning environment. Cogenerative dialogues would subsequently become one of the more powerful methodologies in the research efforts of the DUS.

#### *4.3.4 Re/Making Identities in the Praxis of Urban Schooling: A Cultural Historical Perspective*

The investigation of interpersonal reactions from a historical and cultural perspective would unfold in W. Michael Roth's paper situated in the SEET learning community of City High. The research employed Cultural Historical Activity Theory as a methodology to explore "the continuous making and remaking of the identities of teachers and learners as they participate in the everyday praxis of urban schooling" (Roth, Tobin, Elmesky, Carambo, McKnight, & Beers, 2002, p. 5). The constructs of cultural historical activity theory (hereafter referred to as CHAT) added to the interpretive power of our social theory because it elaborated our notion of structure as the relationship between tools (material resources), division of labor (human resources), rules (schema, strategies of action, habitus, cultural funds of knowledge), and the community (fields) wherein social action unfolds. These components form a set of historically changing

mediated relations within which subjects (students, teachers, researchers) pursue goals. Agency could now be articulated as students' ability to access the human and material resources of the activity system in order to achieve self- or communally-defined goals.

The activity system matrix (see Figure 4.1) helps to visually deconstruct our concept of contradiction as it positions the available resources of a cultural field at the vertices of the activity system triangle. Contradictions within an activity system (field) exist when a subject cannot access requisite material or human resources; when rules are contested (a student's habitus / strategies of action conflicts with the activity system's rules); or when students pursue goals that are not compatible with those of the given activity system (engaging in the campaign for self respect during science elective class).



**Figure 4.1 Cultural Historical Activity System Matrix**

This precise articulation of structure, agency, and contradiction provided a firm conceptual framework to all subsequent DUS researchers and teachers who wished to include constructs from cultural sociology to find and address contradictions within the various activity systems in their classrooms. The research occasioned immediate changes within our science classrooms as we began to pay close attention to providing the requisite resources, establishing common learning goals and equitable divisions of labor, and developing common learning goals. Attention to these components helped make the boundaries of our classroom cultures common goals, reach consensus on rule structures, supply all needed resources and address contradictions that were now more evident and more easily resolved.

Whereas activity theory proved to be an invaluable elaboration of our existing social theory, it was Roth's focus on the evolution of identity and its effect on agency that added a new theoretical construct to our sociocultural perspectives. This research was occasioned by a disagreement between a student and me over the grading policy in my environmental science class. Our investment in social identities that were important to our subjective sense of self and carried considerable social capital in the community exacerbated our differences of opinion to the point that a loud, fractious argument ensued. Roth's analysis showed that our agency within the activity system of the science class was constrained by each other's actions which were perceived as assaults on our subjective sense of self (our identity). Identity he would argue must be included in our social theory because it refers us to the question of who is the agent in an activity system. From an activity-theoretic perspective, identity is a (by-) product of activity. That is, through their agency, the people in an activity not only produce material outcomes, but also, in the process, produce and reproduce themselves and others qua participants in the relevant community (Roth et al., 2002, p. 7).

Roth would add an important element to our sense of structure as he suggested that we henceforth include identity and our students' subjective realities as structural components of our classroom cultures. He correctly suggests that we need pay more attention to these processes because "if we human beings are enabled and constrained by what appears to us in our (subjective) consciousness, then we need to better understand these subjective realities to understand agency in activity systems" (Roth et al., 2002, p. 9). To gain insights into the subjective sensibilities of the participants in this study, Roth introduced the cogenerative dialogue as a method of structured conversation, which allows "differently located participants in the same situation [to speak across cultural boundaries] and arrive at the structural explanations for their different understandings" (p. 36).

The dialogues helped identify (and resolve) the contradictions between my student and me, which deepened our understanding of each other's perspectives and motivations. Our conversations occurred in a newly formed interstitial space wherein existing power relations were equalized and new identities and social relations were mutually co-

constructed. The dialogues were critical to the ongoing transformation of our learning community because “as the identities of [of all participants in a classroom] change through the adoption of new roles, the potential for education to be transformative is much more evident” (ibid).

The work by Roth was pivotal in my effort improve the quality of learning in the SET in my science classroom. Although the quality of engagement in my science classroom was improving, I was not fully satisfied with the level of participation or the academic achievement in my class. Moreover, I did not know what structures were constraining student agency. The introduction of cogenerative dialogues provided a way to include my student’s voice in the analysis of and resolution of contradictions in the classroom field. Seiler (2002) had suggested using student interests as a means of increasing student engagement and agency. In April of 2002, I undertook a research effort to explore how student interests affect participation in the science classroom.

#### *4.3.5 Learning Science and the Centrality of Student Participation*

The research by Cristobal Carambo was informed by Seiler’s (2002) research on student interests. The findings of that research effort suggested that students’ agency was positively affected by inclusion of their voice in the creation of the science curriculum. This research used cogenerative dialogues to determine student interests that became the basis of end of year science activities. The structure of the activities followed the architecture of the activity system matrix to ensure that all necessary human and material resources were available. In order to foster an inclusive and democratic learning community, all goals, rules, and divisions of labor were negotiated with students in whole class cogenerative dialogues. The negotiation of common learning goals was instrumental to this study as it helped foster an alignment between the many cultures in the classroom, which created an environment wherein students could incorporate their cultural and social capital in the learning of science.

The research concluded that the structures of the activities created mutual agreement on goals thus insuring solidarity among the participants. Many traditionally failing students displayed exemplary scientific fluency during the projects. Although many students

demonstrated fluent activity in the May projects, these same students did not alter their participation in the regular science classes. The fact that students exhibited agency and scientific fluency during the activities, but were unable to do so during regular classes suggested that the structures of the science classes did not afford them the opportunity to align their goals and cultural resources with those of the teacher or the science class. The projects proved that inclusion of student voice in the creation of a shared curriculum could improve agency, however more attention was needed on the structures within the school environment that truncated that agency.

An observation by Seiler (2002) suggested that teachers often miss opportunities to build a shared curriculum because we fail to fully “hear, see, and appreciate and build on what [our] students bring to the classroom from their lives” (Seiler, 2002, p. 159). She also noted that educators should develop an “appreciation for African American students’ cultural resources” (ibid) as these may provide a means to structure learning environments that encourage our students to fully incorporate their stores of capital in the learning of science. The research by Elmesky, *Struggles of Agency and Structure as Cultural Worlds Collide as Urban African American Youth Learn Physics*, explored ways to identify and incorporate African American students cultural resources in our science classrooms. Elmesky’s research would prove invaluable as it also addressed ways in which teachers marginalized students whose ways of being differed from their preconceived notions of “appropriate” classroom activities. The research would prove particularly salient to this thesis, as I would realize that my norms of acceptable classroom behavior had inadvertently shut down many students.

#### *4.3.6 Struggles of Agency and Structure as Cultural Worlds Collide as Urban African American Youth Learn Physics*

This research by Elmesky complemented Seiler’s research as it attempted to identify and incorporate students’ cultural resources (their habitus and strategies of action) into the learning of science. Framing her research within a critical perspective, she proposed 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" (Elmesky, 2001, p. 35).

The research methodology was informed by social theory similar to that of Seiler (2002) however whereas Seiler engaged students in the creation of curricular structures that would enhance agency and thus foster transformative change, Elmesky sought to enhance student agency as a way to challenge and transform marginalizing school structures. The research focused on the work of five students as they learned science concepts, which were then applied to the creation of the DUS sound movie. Agency in this study was theorized as "the transposition of schemas and remobilization of resources [so that] old structures can be transformed and reproduction hindered in its tracks" (Elmesky, 2001, p. 52). To this end, the study concentrated on the exploration of the origin of student cultural resources, and how their inclusion affected student agency and the learning of physics. Elmesky identified these practices using interview data and the microanalysis of videotaped student activity. The analysis of video at the frame-by-frame level would become a standard micro analytical method in our research group.

Understanding that the field of the science classroom has porous boundaries that permit the enactment of culture from other fields, she extended her analysis to include the cultural environments of the home and community. Elmesky suggests that without knowledge of the structures and symbols that inform student cultures, "teachers are poorly equipped with the skills for helping their students learn science in a manner that will encourage social transformation" (p. 111). From the analysis of these fields, Elmesky identified strategies of action that contributed to student agency and the learning of science. Commenting on their use she noted that "In the creation of the DUS sound movie, [the students] took science inside of them [and] 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 interaction and determination, in a movie about science" (p. 168).

The window onto these cultural practices proved invaluable as the unskilled observer might disallow these behaviors as inappropriate to the learning of science, and truncate

student agency. However this research suggests that “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 (p. 176, emphasis added). Although student resources were effectively used in one instance, the italicized quote suggests that learning did not occur whenever goals were misaligned. The authors suggest that this was this case: “While, during the science lessons that were separate from the movie production, learning was often ‘accidental,’ however, the study reveals that curriculum should be developed to make these accidents the rule rather than the exception (as evident in the success of the sound movie” (ibid). The sound movie was aided by student cultural practices because the goals of all participants within the activity system were aligned. The question for future research would be how to develop curriculum that would engender such solidarity and a commitment to common goals irrespective of content.

The search for such a curriculum would end with this study as the thesis research by Martin (2005), *The Cultural and Social Dimensions of Successful Teaching and Learning in an Urban Science Classroom*. This study signaled a fundamental shift in our beliefs that transformative science curricula needed to reflect student interests or include their cultural resources as components of the enacted curriculum. Martin’s research was a pivotal moment in our research history as it introduced the sociology of emotions as methodology in our research efforts. Emotions were not new to the DUS as Roth et al. (2002) had introduced the affective dimensions as structures within the classroom field, however the sociology of emotions provided a more robust theoretic with which to conceptualize how emotions enabled or constrained student agency.

#### *4.3.7 The Cultural and Social Dimensions of Successful Teaching and Learning in an Urban Science Classroom*

Martin’s research study was unique to our group because the students in this study were highly motivated, intellectually gifted students of one of the highest achieving selective admissions high school in the country: City Magnet High. These new social conditions allowed the researchers to focus more on the, “practices associated with learning as related to culture and the social structures (both ideological and physical) in which

curricula are enacted” (Martin, 2005, p. 2), rather than on a manipulation of the learning environment in response to student interests or to incorporate their cultural resources.

Although the demographics of this school might suggest otherwise, contradictions within the social spaces and academic achievement of minority cultures (predominantly African American students from lower economic strata) suggested that forces of social and cultural reproduction were marginalizing minority populations and contributing to their academic failure. For this reason the methodology of this study employed a critical ethnographic perspective. The realization that many students had very poor conceptions of their ability and were in fact failing in this institution, led Martin to question what structures and practices within the school (and within her praxis) contributed to this culture of failure among students from minority cultures.

Insightful additions to the analysis of structural components were the constructs associated with Collin’s (2004) sociology of emotions. Martin’s initial analysis of her school’s structure suggested that failed interaction rituals resulting from cultural miscues and incongruities might be responsible for the lack of solidarity between minority students and school staff. Such a lack of solidarity would limit positive emotional energy and negatively affect the sense of collective responsibility for learning.

The introduction of these constructs to our research program would suggest answers to our unresolved questions of how to engender solidarity and commitment to collective goals in the classroom, however it would be the cogenerative dialogue that provided the mechanism needed to communicate across the cultural borders that divided students and teacher. The combination of the two perspectives would begin to provide the means to create and assess aspects of the learning environment (such as solidarity and emotional energy) necessary to build a genuine, cohesive learning environment committed to common learning goals. Analysis of classroom data revealed that many aspects of the classroom structure and teacher practices were in fact responsible for student failure and lack of solidarity. However, as Martin notes: it was not until “[her] introduction to

cogenerative dialogue that [she] was provided with a tool for sustainable change” (Martin, 2005, p. 113).

The cogenerative dialogues unfolded within the various fields that corresponded to her roles as researcher, student, and teacher. They POSITIVELY affected all aspects of her interactions and practice in the classroom. She comments that “these conversations were not only about changing our individual teaching and learning practices, but also the role of structure in shaping our practices and our possibilities for success as teachers and students” (p. 210). Cogenerative dialogues would remain central to our investigation of student perspectives, but adapting the curriculum to their interests or cultural resources would no longer be central to our research efforts. Cogenerative dialogues would be used to help structure learning environments that would engender positive emotional energy and solidarity with the culture of the school science community. This emphasis on a positive emotional climate and solidarity would provide new ways to address issues of engagement, motivation, and commitment to shared learning goals. The sociology of emotions and cogenerative dialogues helped improve the quality of our learning environment because they provided a means to openly discuss contradictions that fostered negative emotional energy and destabilized solidarity.

Olitsky’s (2004) dissertation, *Science Learning, Group Membership, and Identity in an Urban Magnet School* complemented Martin’s work as it also explored how emotions and emotional energy affect student engagement in the learning of science. This research expanded the findings of Roth et al (2002) as it explored how emotions and emotional energy affect a student’s feelings of affiliation (identity) with the culture of the school science community. The research was especially salient to my work as it elaborated Collins (2004) theories on interaction ritual chains and how educators can determine the degree of emotional energy in their classroom.

#### *4.3.8 Science Learning, Group Membership, and Identity in an Urban Magnet School*

This thesis research was situated in the Urban Magnet High School and agrees with the observation by Martin, (2005) that adjustments to the learning environment based on student interest or assumptions about student culture and cultural resources are “ill

conceived.” Such manipulations “can be problematic on both a practical and conceptual level” (Olitsky, 2004, p. 226) as they run the risk of “essentializing” the science content and forget that all culture is always contested and thinly coherent. She suggests “that changing the content alone may not increase student engagement if it is not accompanied by feelings of group membership” (p. 161). The “feelings” of group membership refer to the solidarity that develops as a result of successful interaction rituals that engender positive emotional energy. Successful interaction rituals would foster physical and emotional entrainment resulting in the production of positive emotional energy (EE), group solidarity and “feelings of membership and identity with the relevant group” (p. 227).

The researchers analyzed the structures of the various fields for contradictions that would impede the formation of student school identity and their “feelings” of group membership. Interaction ritual chains are the means through which individuals establish memberships in groups: successful rituals would lead to positive emotional energy and entrainment. These successful interactions were videotaped and analyzed at 1/30<sup>th</sup> of a second per frame. Additional insights were gained by engaging all participants in ongoing cogenerative dialogues that served to verify the existence of “positive emotional energy and group solidarity. A salient segment of this work was a lesson in which group solidarity helped to foster a collective responsibility in a lesson on balancing chemical equations. Olitsky notes that “the positive attitude of the students in this class toward the seemingly irrelevant, and difficult, activity of balancing equations suggests that perhaps successful interaction rituals can facilitate student engagement even with content and procedures that are new, abstract, and are not yet associated with EE” (p. 179).

#### *4.3.9 Cogenerating Fluency in Urban Science Classrooms*

LaVan (2005) continued the exploration of cogenerative dialogues that began with her collaboration on the Martin, (2005) thesis. In this work the focus remained on how to these dialogues affected classroom structure and thus afforded greater agency, however this research combined constructs from Collins (2004) with the methodology of the cogenerative dialogue in order to facilitate communication across borders of cultural

difference and foster positive interaction rituals and greater solidarity in the classroom. “[Cogenerative dialogues meet all four of the requirements bodily presence, barriers to outsiders, mutual focus of attention, and shared mood, for fostering solidarity and community” (p. 131).

LaVan proposed structural changes to the field of the dialogues in order to assure greater student buy in and involvement of the teacher. A set of rules (read by a student at the start of each conversation) provided for equality of voices, redistribution of power (vertically and horizontally), and the creation of a safe emotional environment. A vital component of these dialogues was the commitment to collective action and follow-through on proposed solutions to classroom contradictions. Thus, a requirement of each session was that recommendation for change be implemented or (when change was not possible) that an explanation be offered. LaVan (2005) noted

that As Jen [the collaborating teacher] and the students unconsciously and consciously learned about one another’s culture by being with/in the cogenerative dialogue and the classroom, they learned to successfully interact with one another and in some cases become more like the other, thus demonstrating cultural congruency (p. 134).

Cultural competency promoted greater cultural fluency, which added to our ability to speak across cultural borders and permit the cultural adaptation of all members in the field of the classroom. The new methods allowed for a more efficient means of giving voice to all members of the community and helped generate feelings of solidarity and positive energy.

#### *4.4.0 Feminist Perspectives in the DUS: The Role of Gender in Research and the Teaching and Learning of Science*

Initial concerns with issues of race, class, and socioeconomic status captured the focus of the early work of the DUS. Missing from our studies was a methodology that would “bring gender to the foreground and [attempt] to understand the perspectives of girls and women” (Scantlebury, 2005b, p. 1). Kathryn Scantlebury would bring a feminist research perspective to our research agenda as she investigated the “interconnection of gender with race and socioeconomic status” (ibid). The articles included in this review

of the feminist perspective in the DUS, explore feminist research ethics, identity in the science classroom, and the role of gender in cogenerative dialogues. Given that forces of hegemony and marginalization affect women of color because of their gender and race, critical perspectives inform this research, as it “aspires to be transformative and deliberately considers ways to enhance the agency of women and girls” (p. 2).

#### 4.4.0.1 Learning from Fly Girls: Feminist Research Ethics in the Urban Classroom

Scantlebury (2005b) established the centrality of subjectivity in research and interpersonal relations and introduced the ethics that guide feminist researchers. Central to the ethical code is the awareness of identity and its situated and historically changing dimensions as well as the realization that researchers (and educators) need be aware that our socializations within dominant cultures might produce a “solipsism that could ignore the life experiences of African American girls” (p. 2). Cognizant of the cultural gap between researcher and the students, this research explored the characteristics of black feminine cultural production found in the works of black feminist theorists such as Collins (1990 & 1998), Fordham (1996), and Hurtado (1996). The addition of these feminine voices to our existing knowledge of Black cultural production greatly enhanced our understanding of minority culture and facilitated a greater rapport between female students and members of the DUS.

#### 4.4.0.2 Outsiders Within: Urban African American Girls’ Identity and Science

Given the role that gender plays in structuring the experiences of young women, this research (Scantlebury & LaVan, 2006) explored discontinuities in the construction of the science identities of African American girls and the contradictions that arose because of the differing cultural orientations that structured the field of the science classroom. Difficulties arose because young black women used class time attending to grooming activities, which the young white teacher perceived as disrespectful and counterproductive. Informed by constructs from cultural and African American sociology, the researchers located these actions as part of the campaign for self-respect (Anderson, 1999): the currency in this case was beauty and sexual attractiveness. The combination of the socialization within the culture of the streets and the gender

appropriate practices that reflect mainstream cultural values for women, produced a “female habitus” [that] continues to dictate] their conscious and unconscious behaviors. Cogenerative dialogues helped alter the structures of the class, which allowed the girls to engage in practices that fostered new science identities. These identities were hybrid identities as they contained important aspects of their female identities such as “other mothering and caring. These new identities allowed the girls to move from being “outsiders within the science classroom” to positions as central participants in the construction of their learning.

Although the works by Scantlebury focused primarily on the effect of race and gender on the formation of a science identity, her analysis of my interactions with female students would challenge my belief that I was successfully interacting with all of my students. The findings of her research showed that many of my female students were marginalized by a style of interaction that was not suited to their cultural orientations. Though her research proved disconcerting, it was invaluable to me because I was forced to critically analyze the seeming coherences in my classroom. As I reflected on my work, I discovered other research (Tobin, 2006), that suggested that my “successful” teaching style was based on a set of cultural assumptions that marginalized (and shut down) students whose ways of being contradicted my sense of “proper” classroom decorum (Elmesky, 2005). These research efforts unfolded during a time when I was deemed a “successful” urban educator.

I remain grateful to my colleagues who critiqued my praxis. Were it not for the insights of these researchers, I might have never realized that many students (male and female) were not maximizing their learning potential. Chapter six of this thesis documents

#### *4.4.1 Transforming and Academy through the Enactment of Collective Curriculum Development*

This study by Ritchie, Tobin, Roth, and Carambo (2007), analyzed leadership dynamics as two small learning communities merged to form the Science Engineering and Mathematics Academy (SEM) of City High school. In this study, leadership was not considered as the responsibility of a single individual, rather it was conceptualized as

distributed practice among all the participants in the various fields nested within the learning community. Researchers argued that anyone in the social field can be considered a “leader” if they create opportunities for peers and teachers to improve their practices” (p. 2). Thus, collective leadership was theorized as the “process by which members of the group create structures that afford the agency of the participants in a given social field.

Leadership was further elaborated as either transformative or transactional practice. Transactional practices focus on the structural concerns of stable institutions, while transformative leadership focuses on the participants, their interactions, and the transformation of their emotions, beliefs, and attitudes towards a given cultural field. Transformative leadership is therefore fluid, emergent and involves the practices of a wide array of participants as they access structures and resources that engender positive emotional energy and build solidarity (as a feeling of membership or affiliation) with the work of the group. The emphasis on collective practice and group solidarity made this study particularly relevant given that the SEM academy was in the process of merging two very distinct (and occasionally distrustful) groups of teachers into one community.

Cogenerative dialogues became the principal method used to build a collective vision and distribute leadership duties among the members of the SEM academy. Cogenerative dialogues were especially useful to this research as they allowed participants to have an equal voice in the processes of building the academy structure. As a result, cogenerative dialogues became sites of successful social interactions that fostered positive emotional energy and engendered solidarity with the work of the SEM academy. In this way distributed leadership practices helped unify the two teaching staffs while building a common vision for the academy.

This study was particularly useful to the ongoing work of the DUS as it extended our understanding of the sociology of emotions to fields outside of the classroom. The researchers used constructs from Collins (2004) to analyze dialogues between administrators and teachers for evidence of successful interactions and positive emotional energy. In this manner, the cogenerative dialogues became resources for the

ongoing transformation of praxis as they helped resolved the many contradictions that arose during the creation of the SEM academy.

#### *4.4.2 Conclusion of DUS*

The research efforts of the DUS officially ended in the fall of 2006 when the NSF funding cycle ended. The work of the teachers and researchers has continued as many long lasting professional relationships were formed during our time together. We have remained united in our commitment to a critical scholarship that will make our science curricula a catalytic and transformative force in the lives of our students. It is heartening to know that our work with cogenerative dialogues and the sociology of emotions informs the theoretical perspectives of researchers in other urban centers. The ongoing work fosters solidarity through cogenerative dialogues that celebrate differences. Thus although the DUS is gone, our work continues to promote a science that is genuinely inclusive of ALL students.

#### *4.4.3 Theory | Praxis and Continuing Transformations*

My enculturation into this school community was enabled by a variety of structural resources that allowed me to bridge the cultural gap separating my students and me. By the end of my first year of practice, much of the resistant, oppositional culture had dissipated as the combined efforts of the teachers, coteachers, and administrators in our community had helped create a more congenial, cooperative teaching | learning environment. The work of the DUS proved invaluable to the continued transformation within our learning community as it provided the theoretical perspectives with which to analyze and resolve existing contradictions within our praxis. The resolution of contradictions often necessitated new conceptualizations of theory; thus, praxis also informed theory in a recursive dialectical manner. This ongoing interaction between theory and practice catalyzed the continuing transformation of our learning community, as the resolution of each contradiction became the site of new understandings and ongoing personal development.

This would be the case in the fall of 2001 as contradictions in my relationships with my students would require a theoretic that could address the student's subjective sense of

self (their identity) as part of the structures within the classroom field. The research by (Roth, Tobin, Elmesky, Carambo, McKnight, & Beers, 2002) analyzed the role of identity (and emotions) within the enacted curriculum and employed cogenerative dialogues as a methodology to resolve the disagreement. Cogenerative dialogues as elaborated in the research by (LaVan, 2004) and (Martin, 2005), would become the principal method used to resolve conflicts and co-construct learning environments in a manner that engendered trust and mutual respect between all participants in a given social field. A second argument in the fall of 2001 would necessitate that I expand my understanding of emotions and their role in the teaching and learning of science.

Although our cultural sociology had served us well in the past, the inclusion of the emotions as a structure within the learning environment necessitated new theoretical perspectives. It would be the emerging conceptualizations of the sociology of emotions in the works of Martin, (2005) and Olitsky (2004) that provided the theoretical framework needed to fully address these contradictions in my praxis. Our understanding of emotions (negative and positive) and their effect on identity and solidarity within the culture of the school science community would greatly increase the analytical power of our existing theories on culture and cultural production. The following chapter is informed by my emerging understanding of the importance of the continuing development of our cultural identities and the centrality of emotions within the urban science classroom.

CHAPTER FIVE:  
TRANSFORMATION OF A SCIENCE LEARNING  
COMMUNITY

**5.1 CONTINUING STRUCTURAL CHANGES: FALL OF 2001**

My involvement with the DUS research program provided vital theoretical perspectives that informed and guided the continued transformation of praxis. The weekly seminars allowed me to critically assess events in my classroom and (along with insights from fellow researchers) determine how best to structure rigorous, equitable, learning environments that would maximize my students' learning potential. Ongoing collaborative research in our small learning community enabled a continuation of the changes in structures and practices initiated during the spring of 2001. Coteaching which had proved so beneficial to our students was greatly expanded as four student teachers were assigned to our two ninth grade classes. Their work with our "Ninth Grade Initiative program" was geared to providing incoming ninth grade students study and organizational skills that would help them adjust to the academic demands of high school science curriculum. The intent was to create supportive structures in the science classroom that would increase student agency and decrease the incursions of oppositional culture. Additional coteachers were also assigned to each of my chemistry, biology, and environmental science classes. Their presence in my classroom provided me the space to interact more closely with my students and build many trusting, genuinely supportive relationships. During these months, our associations with local institutions expanded so that we were able to supply additional human and material resources to supplement our classroom activities and laboratory explorations. The 'Labs at Penn', and the 'May Projects', documented later in this chapter are the direct result of our collaborations with our community partners. Such an array of resources and structural supports greatly enhanced the enjoyment of the science curriculum and helped me build a reputation as a "great teacher" someone who was 'cool and fun" (Roth, Tobin, Elmesky, Carambo, McKnight, & Beers, 2002). My increasing social capital and many amicable, collegial relationships with students and staff, approbated a sense that I had successfully bridged the cultural divide that had problematized my first months in the school. The quality of

my science curriculum, student engagement and the absence of serious confrontations in my classroom suggested that I now knew how to teach and successfully interact with all my students. The changes in my style of teaching and interacting with my students led me to believe that I had forged an effective, viable cultural identity. Events in the first weeks of October would however, prove otherwise.

## **5.2 INCIDENT WITH YA-MEER**

### *5.2.1 Environmental Science Class: October 2001.*

Ya-Meer a student in my 11<sup>th</sup> grade environmental science class was one of the better achieving students in our learning community. He was a slightly built young man, with glasses and a quick smile, who was well liked in the community. I had met him during the spring 2000 semester, when he was enrolled in my biology class. We had no serious issues between us thus we had established a respectful, amicable relationship. My teaching during the spring semester had earned me a good deal of respect among the students in the community, thus our environmental science class was generally orderly and responsive to my instruction. I was therefore very surprised when a loud contentious argument broke out between Ya-Meer and me. Although the confrontation lasted for only a few minutes, the disagreement endured for nearly one week.

The incident is salient as it foregrounds vital components of the ongoing transformation of my praxis. Although the altercation was initially destabilizing, the varied resources in our learning community provided structures that helped facilitate an amicable resolution to our disagreement. Cogenerative dialogues provided a structure wherein we could talk freely in a space free of official hierarchies or power differentials.

### *5.2.2 The Argument*

The argument began as I returned graded tests on the effect of pollutants in the environment. Charles, who had a history of average achievement, had earned a 93%. I congratulated him openly on his accomplishment and continued handing back papers. Ya-Meer upon receiving his paper asked, “How’d I get such an 83?” I told him that I would review his test towards the end of class. When I reviewed the grades, I realized that I had made an error: Ya-Meer’s grade was in fact a 65: the 83 was another student’s

test grade. Ya-Meer grew quite angry and shouted “How’d I get a 65”? Although I was sympathetic to his feelings, I told him that I would not respond to him if he continued to shout at me. He quieted down and we proceeded to look over the test. Out of five answers, he had answered only two completely right: had earned partial credit on two others and had missed the fifth. Ya-Meer could not understand why he had received partial credit for his answers. I tried to explain that his responses were not adequately explained or supported with concepts we had studied in class. Ya-Meer however, would not agree with my evaluation of his answers and continued to insist that he could not have gotten such a low grade. I attempted to explain my reasoning once again, however we could not resolve the issue. Our inability to communicate frustrated (and angered) us: thus, our discussion turned into an argument. At one point, Ya-Meer became quite angry and started to shout once again. I had not had a student publicly disrespect me in a very long time, thus as his anger grew so did mine. The argument lasted for some minutes when Ya-Meer suddenly shouted, “Man I don’t want to hear any more from you” and stormed out of the room. I followed him into the hall as leaving the classroom without permission was a serious infraction in our learning community. In the hall, he yelled at me once more and would not return to class. I informed my coordinator, (as per our conduct policy), and she arranged for a teaching assistant to find him and bring him to her office.

By the time class had ended, Ya-Meer had been located and was sitting in our coordinator’s office. I had calmed down since the incident and attempted to discuss the grade with him once again. My attempts were fruitless as he was still convinced the grade should be higher: we began to argue once again. Our coordinator was unable to broker a compromise as each of us had hardened our positions. Ya-Meer felt that my refusal to reconsider his grade was evidence that “You teachers always want to be right.” I felt that he was being overly obstinate and said, “I can’t talk to him any more; he’s crazy.” I then left the room.

### *5.2.3 Cogenerating Solutions*

Fortunately, events did not end with this first day’s impasse. The next day we met briefly in our coordinator’s office. We apologized to each other and decided to use our resources

to find a solution to the problem. During the next several days, Ya-Meer engaged in cogenerative dialogues with a student teacher, and two university researchers. Through his ongoing dialogues, he was able to clarify and articulate (both to himself and to others in our community) his perspectives on the incident. During that time I too was able to reconsider my actions in the event and, through discussions with co-researchers, was able to understand Ya-Meer's perspectives on the events in our classroom. A few days later, we met once again in the coordinator's office and had our own cogenerative dialogue. Although we had known each other for over a year, we had never spoken of our personal histories, of our families, or our goals as members of the SET small learning community.

The incident is salient as it foregrounds vital components of the ongoing transformation of my praxis. Although the altercation was initially destabilizing, the varied resources in our learning community provided structures that helped facilitate an amicable resolution to our disagreement. Cogenerative dialogues provided a structure wherein we could talk freely in a space free of official hierarchies or power differentials. The following excerpts of our cogenerative dialogue are taken from the research paper, *Remaking identities in the praxis of urban schooling: A cultural historical perspective*, (Roth et al., 2002).

Ya-Meer:

*From my end of the situation: Like the only reason why, I just got mad because it wasn't my paper that you read off your sheet. But then when you told me that I had the sixty-five. The reason why it made me mad is this is my last year; I want to get straight A's. And the sixty-five won't help me out at all. So I was mad more with myself than with you. And my first reaction was, "How do I get a sixty-five?" I was still mad; I wasn't really hearing you. I wasn't listening to you while you was talkin'. But I was listening to you a little bit, like when you say, let's go over it; you started to read the question, where I had the most points off. And I answered the question the way you wanted it but it wasn't good enough. And that's why I left the classroom. Because I could have done more than leave the classroom but that was the best thing I did.*

As I listened to Ya-Meer I grew to understand the cause of our altercation and how my actions had occasioned the anger that so quickly overtook the classroom. The catalyst to

the event was my inaccurate grading and failure to correctly identify his test paper. This communicated a lack of esteem and inattention to his talents and motivations as student.

Cristobal:

*I realized when we had that conversation that I said to you, "What is it about that I did?" and you said that I wasn't clear about the grade. And part of me thought, "you know," and then I realized if that's where a little bit of disrespect happens because when you first asked me about the grade and I say sixty, fifty, or eighty-one, I didn't really care, because to me, numbers don't mean anything. And the grades can be changed. But what was a disrespect of you was not realizing how important numbers are to you as a student. So I didn't take into account that the sixty-five might have shocked you and I should have been more careful. And so the fact that you are trying to remake yourself as something, as a student, and you are looking at the grades and I don't care about grades...but that is where the disrespect comes in. Because you don't realize how important things are to other people. So that is one thing that I realized; that I need to respect people find out what their terms are very clearly. Because I think that even if I disrespect someone I can't then go back and say, "I am so sorry I didn't mean to do that." You can't risk disrespect at all.*

Reflecting on the event, I came to understand just how important grades were to him and how demeaning the low grade was to his identity as a high achieving student. Listening to his version of events clearly identified the contradictions in the classroom field, which made him feel disrespected. The dialogue revealed that disrespect was the catalyst of the disagreement in our classroom. Once disrespect entered, the environment communication was no longer possible and negative emotional energy flooded the learning environment.

Ya-Meer:

*Respect is the most important thing in what happens here at school. A lot of times students would disrespect teachers because they have problems.... they just be having problems... that they can't express to teachers... that they don't feel right showing teachers... like they got a problem at home that is stressing them out, and the teacher don't know what that problem is like for the student.... So, like if I*

*got a problem at home and I put my head down and you come over to me and tell to put my head up. I would think that you bothering' me. And I would just start flipping'. Just because of my situation at home. And that would be like disrespect to the teacher but the teacher doesn't know much about what happened at home. So people bring situations outside a school to school and they just offend the teachers. And a lot of times teachers got so many students at one time... and sometimes teachers don't care about students. A student can do one thing that teachers don't care about. And that teacher would think that student is disrespecting them and they go off too.*

Cristobal:

*That is true. Especially in our community where kids have such hard times without us realizing it. A lot of times it is in the morning when they tell me, "Get the f\*\*\* out of here." And all you did was to say, "Put your coat away." That response comes from something that they had coming out of their life. And sometimes the teacher is worried about the lesson, something going on in school or in their own lives, and then they don't have the time, or can't take the time to take that little step to find out what is going on with kids.... and if a student is having problems and disrespects the teacher... then the teacher will say, " Oh Yeah? Let's go. You are out of here!" The other kids know what's going on and this creates a feeling in the class that we don't care about you, and the kid next to him sees that. And the next time they have a problem, they just flip right away.*

Reflecting on what each of us had experienced I could see that our actions had called into question the cultural identities we were so carefully constructing. As Ya-Meer spoke about his family, his history as student, and his aspirations to be a "straight A student", I realized that I had failed to fully understand his biographical narrative and how important his grades were to his emerging identity as one of our communities highest achieving students. I would learn later that it is our historical biographies, (and our emerging sense of self), that inform the internal subjective narratives that we use to order and structure our experiences (Roth et al., 2002)

Frequently these narratives articulate the environment that [we] experience as enabling or constraining individual agency. These narratives, which are used to

sustain self-identity, are *inherently fragile*, for they have to be created and continually reordered against the backdrop of new and changing experiences of everyday life and in a context of individuals participating in numerous fields, experiences that tend to fragment perceptions of the self (p. 9).

My incorrect grading created an incongruity between his emerging sense of self and the experience of his failing grade. It was this incongruity between his expectation and the experience (Turner, 1999) that occasioned the anger and frustration he exhibited

[emotions] are marker or a sign that a particular identity, which an individual expects to confirm, has not received the such confirming responses. ... the activation of either negative or positive emotions is related to whether or not anticipated confirmations of relative status or power have been realized (p.144)

If one's perception of self is not confirmed thence an incongruity between expectation and experience occurs: in such instances negative emotions (anger, fear, or sadness) result: if there is congruity, then the more positive emotion (happiness) will ensue.

In retrospect, I realize that the incident could have been avoided had I realized how important (and fragile) Ya-Meer's emerging identity was to his agency as student. My responses to his failure to acknowledge my status suggest that it would have also served me well had I realized how important my newly found cultural identity was to me. In our cogenerative dialogues we would each discover that it was the assault on our nascent identities which occasioned the anger and negative emotional energy that occasioned our disagreement: the issue of the test grade was secondary.

The incident with Ya-Meer while disconcerting provided important theoretical insights into the role of identity formation, the affective components of activity systems, and the structure of cogenerative dialogues. Each of these constructs proved useful in the analysis of the "argument" and each would remain as a guiding framework in the continued transformation of our learning community.

### **5.3 IDENTITY IN THE SCIENCE CLASSROOM**

#### *5.3.1 Successful School Science Identities*

Identity can be broadly defined as "our sense of who we are, our place in the world and our perception of how others see us" (Brickhouse & Potter, 2001, p. 966). Our identities

are informed by our membership (our affiliations) within given communities of practice and the efficacy of our engagement with significant others within those communities. Membership within a community of practice occurs when we (subjectively) align ourselves with the culture (the dispositions and practices) of a community and engage in meaningful goal oriented activity with the members of that community (Lemke, 1995). An affiliation with the culture of the school-science community is essential within a sociocultural theoretic which views the teaching | learning of science as cultural enactment that unfolds as collective social activity. As such, successful school science identities are critical to our efforts to provide transformative educational opportunity because they indicate the degree to which students subjectively align themselves with the culture of the school and of the scientific community (Brickhouse, Lowery, & Schultz, 2000)

In other words, to understand learning in science, we need to know much more than whether students have learned the proper explanation for how plants make their food or why there are seasons. We need to know how students are engaging in science and how this is related to who they think they are (what communities of practice they participate in), e.g., a good student, a basketball player, a gossip, and who they want to be (what communities of practice they aspire to): As students transform their identities, the requisite knowledge and skills for being a part of the new communities are learned. Thus, if students are to learn science, they must develop identities compatible with scientific identities (p. 443).

It is important to note that exemplary science learning requires a high degree of personal motivation and commitment to the culture of a given community. Teachers can create equitable learning environments, well-structured science curriculum, and access to requisite structural resources but is finally the student who determines the level of personal commitment to his / her learning.

Ya-Meer

*And that's why I left the classroom. Because I could have done more than leave classroom but that was the best thing I did. Because I could throw a desk, just because I was mad at you. I could have done something. But... I left the classroom.*

Later after he considered leaving the class, he realized a different set of options based on his desire to be a successful member of our school community.

Ya-Meer

*It was the next day when you and Miss Smith called me into the office. I was still mad. And then when we were talking, then, I wasn't listening to you. And then I was, all right, I mean they are trying to show me respect. And so I got to show them respect. And that is what I got after that conversation coz I actually went to Miss Smith and this one led to the second conversation. I went to Miss Smith and I told her that I was wrong for the whole, that I was dissing you all like that. So I say, "I am done with it. I apologize." I was thinking, "This is not helping me at all. Me getting mad in the classroom, this is not helping me to do what I want to do."*

### *5.3.2 Historical and Emergent Identity*

Identity consists of two differing and complementary aspects of the self: a historical (fixed) autobiographical narrative; and a provisional emergent identity that together provide the mechanism for the continued evolution of the self (Olitsky, 2007). Our historical biographical narrative provides the schema (our internal voice) through which we analyze and reflect on our experiences and activity within our communities of practice (Archer, 2003). In this manner, our historical narratives help order and maintain our stable 'sense of self'. Though we all have a sense of a stable fixed biographical self, it is necessary to note that the identity of an individual is

not something that can be taken for granted as an a priori of activity, but is something that is made and remade as activity is enacted and when individuals participate in multiple activity systems (Roth W.-M., Tobin, Elmesky, Carambo, McKnight, & Beers, 2002, p. 7).

As we engage in cultural activity, we access relevant schema to appropriate requisite resources to pursue our goals. If there is coherence between our schema (our identities in this case) and the structures of the field, then resonance occurs and culture is enacted without incident. In these instances, culture unfolds without incidence, as there are no contradictions within the field. If contradictions exist, then agency is truncated and the

boundaries of the field are breached as participants enact culture that will help them achieve their goals. This is often the case in urban classrooms when students disrupt the learning environment or when teachers enact symbolically violent culture, which is disrespectful and equally disruptive. In such instances cultural boundaries harden and communication | negotiation becomes impossible. The commentary between Ya-Meer and me during our fight exemplifies such hardened cultural boundaries.

Ya-Meer

*I was still mad; I wasn't really hearing you. I wasn't listening to you while you were talking.*

Cristobal (Day 2)

*I'm not talking to him any more. He's crazy!*

Fortunately, we had access to resources that allowed us to move into the 'in between' spaces...that initiate new signs of identity, and innovative sites of collaboration and contestation ( (Bhabha, 1994, p. 4) as cited earlier).

The many cogenerative dialogues that ensued provided access to an interstitial space wherein we could interact with each other to fully understand each other's perspectives and motivations. It was within this social space free of official hierarchies and power differentials that we were able to communicate and negotiate a resolution to our disagreement. Our ability to see the other's perspective and negotiate an agreement to our dispute engendered a great deal of mutual trust and reaffirmed our respect for one another.

### *5.3.3 Ascribing Identity*

The argument with Ya-Meer illustrates the contradictions that arise when one assumes that one has fully understood the cultural perspectives and motivations of one's students. In many instances, one is focused on an assumed historical identity, while failing to acknowledge the student's emerging identity. The argument could have been avoided had I noticed Ya-Meer's emerging identity and his efforts to be a straight A student. Knowing this I would have been more attentive to his grades and more sensitive in publicly discussing a sub par performance. The incident also suggested that I too had made

assumptions about my identity. The successful nature of my interactions with students during the spring and early fall of the year had given me a sense that I had forged a viable cultural identity. If I had considered my newly formed cultural identity as a moment in my continuing transformation rather than a stable end then I would have avoided the assumptions that so disrespected Ya-Meer. The incident showed me that many of my perspectives still needed to change, for there were many facets of my students' lives that I still knew little about. My failure to understand Ya-Meer demonstrated the need to continually interrogate all aspects of the classroom field for unexamined assumptions or hidden contradictions that might constrain (or enable) student agency. One these, was the affective dimension of the classroom activity system.

#### *5.3.4 A New Theoretic: The Sociology of Emotions*

Although students had routinely displayed their emotions, I had never considered emotion as a structure within the learning environment. The contrast between the negative emotions displayed during the argument with Ya-Meer, and the more positive emotional energy that characterized our cogenerative dialogues suggested that students' emotions and the resulting emotional energy (Collins, 2004) were essential structural component of successful social interactions in the classroom field (Martin, 2005)

Although our cultural sociology had proven useful in the transformation of our learning community, my lack of understanding of the importance of emotions indicated the need for a new theoretic that would help analyze (and resolve) contradiction that affected the emotional climate in my classroom. This would be a moment in which a new theory would emerge in response to the discovery of hidden contradictions in my praxis. Fortunately, members of the DUS were exploring emotions and emotional energy as structures that (enabled or constrained) student agency in their science classrooms. Their work in this area (Oliskty, 2004) and (Martin, 2005) would expand our understanding of emotions (Turner, 1999) and their role in the creation of successful social interactions (Collins, 2004) in our classrooms. A second argument with my students in December of 2001 would provide the opportunity to use these new perspectives in the continuing transformation of the SET small learning community.

## 5.4 A DISCUSSION WITH IVORY OVER HOMEWORK

### 5.4.1 Context of the “Fight”

The December 5, 2001 class was part of our mini unit on the chemistry of batteries. Our interest in electrochemistry arose from a discussion of chemical reactions that are important in our everyday lives. In our previous class, we had analyzed the processes of oxidation – reduction occurring in the single displacement reaction of copper (II) chloride and Aluminum metal. Students were shown how to write out the oxidation – reduction half reactions that illustrated how redox processes generate a flow of electrons. The homework assignment was to read three pages in the chemistry textbook and to “compare and contrast the processes of oxidation – reduction.” The goal of this day’s class was to reinforce students’ understanding of these reactions and prepare for our upcoming laboratory on the electrochemistry of batteries. The opening minutes of the class were discomfoting as I realized that few students had an adequate understanding of either oxidation or reduction. Although we had analyzed redox reactions in the previous class, few were able to describe either chemical process. A disagreement ensued when I admonished them for their lack of effort and inattention to our class work.

### 5.4.2 A Disagreement Ensues

12:19:54	Carambo	Not facing students	You all obviously don’t pay attention. This is from Monday’s class, but no one seems to listen (Writing on the board, my back to the class)
12:19:57	Ivory	Speaking out loudly, hurriedly	You didn’t go over that on Monday..., you put the words on the board but you didn’t go over it. I wrote them down in my notebook you put the words on the board but you didn’t go over them Yeah he didn’t.
12:19:59	Many overlapping voices: agreeing with Ivory		Put them nowhere I know he ain’t Ain’t no one able to
12:20:06	Carambo	Shouting over the class	Okay, Okay, Okay
		The room quiets	Excuse me Did you not on Monday do the half reactions and I put over there (pointing to the side board) on that board the reactions and I put the words oxidation reduction I didn’t do that on Monday?
12:20:26	Ivory		You put the words on the board but you didn’t tell us the meanings
12:21:19	Carambo	Interrupting	Of course I did: (Moving to her desk)



Mr. Chris and I huddle at Ivory's desk and check her notebook. She has notes on the half reactions, but no clear definition of either reduction or oxidation. In speaking with her, it becomes clear that she tried to do the reading, but couldn't understand the text: thus, she has nothing written in her notebook

**Figure 5.1** Mr. Chris and I huddle at Ivory's desk

As I talk with other students, it is clear that only Ivory and two others attempted the reading, but they too have no written work. The homework was meant to extend and reinforce the class work: but since no one completed the homework, I decide to start the class with a review of the concepts. As I write the definition of oxidation, I remind them of Monday's class work.

12:22:23	Carambo	Pointing at the board	We did this on Monday. I remember clearly I said this is oxidation and then I asked what is the opposite, what is the opposite of this? This is....
12:22:31	Jack	Interjecting overlapping	Yeah you said something like that.
12:22:33	Carambo	Continuing	...oxidation and reduction is the opposite, I know that I said it and then I said this is the definition.
12:22:35	Ivory	Interrupting overlapping	You might have said it...
12:22:36	Carambo	Overlapping	I know I did
12:22:37	Ivory	Overlapping	That's what I'm talking about, you might have said it out your mouth, but you didn't write it on the board
12:22:40	May		I know he didn't I got the notes right here
12:22:43		May leans over showing Ivory her notes	(She and Ivory compare notes)
12:22:45	Jack:	Continuing to speak	Yeah... I... but didn't no one say you got to, got to...

At this point, the class begins to fall apart as many students begin to voice the opinion that I had not written the definitions of the board. The number and intensity of voice increases as everyone tries to speak simultaneously. The class fills with overlapping

hurried, uncomfortable talk. Mr. Chris talks over the din attempting to quell the argument.

12:22:55	Mr. Chris	Talking over the class	You know what it's possible that we didn't, I mean you guys may be right, but even if we didn't....
12:22:59	May	leans over to Ivory showing her notes	
	May	showing Ivory her notebook: they nod in agreement	
12:23:04	Ivory	May as she looks at the notebook	Yeah that's what I'm talking about he ain't put nothing up there

Mr. Chris continues trying to explain what we did and what we expected them to accomplish.

12:23:07	Mr. Chris	Speaking Over the students' loud voices	Even if we didn't. This is what I'm saying.... Even if we didn't write the word definitions on the board. . We talked about it...right? So.... So ....we all know what an oxidation reaction is, right?
12:23:24	Ita	Overlapping	Yeah ... you didn't write it down though
12:23:26	May	Overlapping	You just wrote some words on the board
12:23:26	James	Overlapping	I remember doing that, yeah, why can't we do it now?
12:23:30	Jack	Overlapping	Yeah but if we...
12:23:31	James	Shouting	Yeah but if we ready why can't we just do it know though
12:23:34	Mr. Chris	Talking loudly to the class	No, no what Mr. Carambo is saying is that we've gone over this..
	James	Shouting	Mr. Chris, Mr. Chris.... why can't we...
12:23:44	Ivory	Shouting out; bothered	I'm not saying ya'll didn't write it down it I'm just saying ya'll didn't go over nothing (Pointing at the board speaking forcefully)
12:23:45	May	Overlapping speaking simultaneous with Ivory:	Yeah you all didn't say nothing about us doing us writing nothing else down, you all (also gesturing towards us and at the board).



Figure 5.2 May and Ivory protest my criticism

Loud protests dominate the class as students insist that we did not teach the concepts correctly. May and Ivory compare notes from Monday's class confirming what each has written and although Mr. Chris has continued to explain our intent, they remain unconvinced.

12:24:06	Ivory	Speaking to May and looking in her notebook	Yeah see that they didn't (Pointing to her notes and looking towards us).
12:24:09	May	Nodding in agreement	Yeah I got the same notes here (Tapping her notebook)
12:24:14	Mr. Chris	Speaking over the class	That's what we did on Monday ...

Several students who refuse to stop talking interrupt Mr. Chris. He waits briefly. The class quiets down. He continues speaking

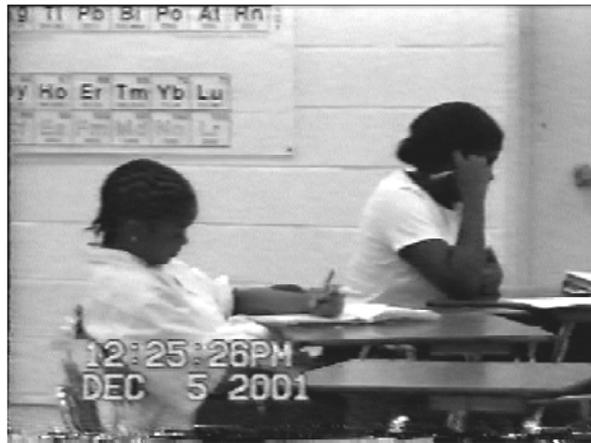
12:24:31	Mr. Chris	To the class	When we wrote those reactions (pausing). When we wrote that stuff down ... <i>that's in our world</i> . Maybe this sentence (signaling the board work) doesn't mean anything to you (pausing)... right? But when we show the reaction and get it so you can see it, and then write the word oxidation on top...That's a definition.
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#### 5.4.3 Discovering a Solution

As Mr. Chris speaks, I circulate through the class checking notebooks. Listening to my students' loud protests, I can tell they are clearly offended by my suggestion that they were not paying attention to Monday's class work. Many of the students have written the reactions from Monday's class in their notebooks, but nothing else: others have failed to take any notes. With the exception of a few students no one has any explanatory remarks, or definitions, or terms written in their notebooks. Looking at their work and listening to Mr. Chris's explanation of our teaching method, I realize that although we felt that the example of oxidation was a "definition" of the process, students needed to have the terms explicitly written out as notes for them to copy off the board. I on the other hand had expected them to read the definition in their textbook and then relate that to the day's work. Since many did not have an adequate definition that explained their class notes, few could relate the textbook language to that of the day's class work. This is why Ivory said she "didn't understand the book and "couldn't find the answers." Having finished the notebook check, I return to the front of the room and wait for the voices to settle down. One by one, the students see me at the front waiting. Finally, the room grows quiet:

12:25:10	Carambo	Smiling at the front of the	Are we finished fighting?
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		room	
12:25:11	Ivory	Interrupting:	I ain't worried about it.
12:25:12	Jack	Quietly interjecting	We just trying to get our point across
12:25:18	Carambo	Breaking the silence	So you...so you going to
12:25:19		Interrupting, overlapping	Ain't no point talking about it ... I ain't even worried about it..
12:25:21	Ivory	Softer tone, not to the entire class	Go ahead (slight pause) Ya'll right we're the problem
12:25:23			No, wait, wait... (Ivory stops speaking)
12:25:26	Carambo	Interrupting	Ivory...(She won't respond), Ivory, Ivory... (Ivory stares at her desk: she will not look up)



**Figure 5.3 Ivory and May refuse to make eye contact**

#### *5.4.4 Resolution: Might As Well, I Don't See Why Not...*

Ivory refuses to make eye contact with me. Throughout the discussion, she has been the most vocal arguing the point that it was our failure to clearly go over the definitions that occasioned the class's difficulties. She is particularly upset, as she was one of the few students who genuinely tried to do their homework. It is important that I address her feelings, as it was never my intention to disrespect her. As mentioned in the introduction, these moments of incongruity need to be addressed if we are to create learning environments that fully respect students' ways of being. The argument was the result of differing ways of interpreting, "definition" written on the board. Thus while some students had clearly failed to do their homework, Ivory (and a several others) had genuinely tried to complete the assignment. It was therefore critical to the ongoing development of our learning community that I address how I had disrespected her.



Figure 5.4 Waiting for Ivory to smile

Several students are looking at Ivory waiting for her response. The tone of the class is subtly changing as I attempt to soften Ivory's mood. May looks over at her, a smile on her face. I attempt to engage her once again

12:25:28	Carambo	Looking at Ivory	Ivory, Ivory
12:25:30		Still refusing to look up	What
12:23:31	Carambo	Waiting for a response	Look at me Ivory, (pause) Ivory
12:23:32			Ma'am? (Pausing) waiting...
12:23:34	Ivory	Stretching broadly: a smile breaking across her face.	No... Rumbo...
12:23:36	Carambo	Smiling as he talks to the class	It all feels good we're arguing our points but ain't no one mad We're still friends... And you shouldn't be mad either because we're having a good old fashioned argument. You have your opinion and I have mine but we shouldn't fight
12:23:54	Marquist	Interrupting...	I wanna rumble
12:23:56	Carambo		I don't wanna rumble with you cuz you bigger than me...

Marquis is a very large, playful young man. He is much larger than I am and quite strong. The class laughs at our interchange, as it is a long running joke between us. The brief spate of humor further lightens the class atmosphere. I continue speaking.

12:26:00	Carambo	Still smiling	It's good that you guys stand up for your rights... telling me "Yo man you didn't write it down", that's fine with me but we should never attack each other.
12:26:06	Marissa	Interrupting, Laughing	No. Let's just keep on arguing you're trying to talk stuff out
12:26:09	Once again, the class starts to laugh.		



**Figure 5.5 "Might as Well, I don't see Why Not"**

As we laugh, Ivory makes eye contact with Marissa and then towards me. She then speaks over the class and says to Marissa.

12:26:11	Ivory	Smiling broadly	Might as well... (Looking over at Marissa)
12:26:12	Marissa	Nodding as she speaks.	I don't see why not.
12:26:13	Carambo	Smiling to both students...	Might as well... I don't see why not.

The phrase “Might as well,” “I don't see why not” had developed during previous disagreements: it was our code for a willingness to agree with each other's opinion on a given topic. Saying” Might as well,” signaled a willingness to go along with a suggested compromise; while the phrase “I don't see why not,” meant that one understood (or was willing to entertain) the other person's point of view. When Ivory says this, it signals the “end” of our argument. Ivory's comments and her facial expressions communicate that all is well between us.

Though the discussion had taken 22 minutes of class time, the resolution had fostered a distinctly positive emotional mood as evidenced by the playful comments, laughter, and relaxed classroom atmosphere. Although the contradictions in the classroom field had occasioned a great deal of negative energy, our willingness to acknowledge our differing points of view and negotiate an amicable resolution had reaffirmed our respect for each other. Thus, our argument served to bind us together as a learning community with a shared commitment to the learning of redox chemistry.

*5.4.5 An Impromptu Cogenerative dialogue*

Before moving on to the day's work, I take a moment to discuss what occasioned our argument. It was important that students understand why I was so disappointed when many failed to do their homework, and why I accused them of not paying attention. It was equally important that I acknowledge those that did attempt to complete the assignment and how my teaching practices made it difficult for them to fully understand the previous day's class work. This would be an impromptu cogenerative dialogue as students explained that they had tried to do the homework, but were not able to connect the readings to the class work because they didn't have a firm understanding of the meaning of either oxidation or reduction: just having the half reactions was not enough. This is why so many felt unprepared to answer my opening questions. I reiterated Mr. Chris's explanation that for us, the examples of oxidation - reduction that we wrote on the board were our way of defining the redox processes. That is why we felt that we had already defined the terms: the reading was just an additional manner of defining them. We ended the discussion with an agreement to go over Monday's work again and to postpone the Friday test until Monday so that they would have more time to study.

Our brief cogenerative dialogue allowed me to articulate my perspectives on the importance of high academic standards and the necessity for rigorous daily classwork (and homework), while supporting their right to protest teaching practices that made such learning difficult. More importantly, by agreeing with their view of events, and changing my instructional plans, I demonstrated the respect that I had for them and my earnest desire that they be successful chemistry students.

In the end our ability to understand and accept how each had construed the situation differently is an example of the kind of negotiation | communication across difference that builds trust and mutual respect. As noted in the introduction, mutual respect must be actively co-constructed, as it is foundational to transformative learning environments. This day's events are further proof that circumstances that occasion symbolic violence can arise at any moment. Failure to address such contradictions can elicit negative emotions that create disharmony and destabilize the learning environment.

## 5.5 SOCIOLOGY OF EMOTIONS

### 5.5.1 *Emotional Energy*

The resolution to the “fight with Ivory”, is an example of the kind of negotiation | communication across difference that helps co-construct trust and mutual respect. Though I had admonished the class for being unprepared and not doing the homework, I was willing to acknowledge how I had contributed to the day’s difficulties. Students also realized how their failure to fully complete their homework had frustrated and disappointed me. Our willingness to acknowledge and honor each other’s perspective reaffirmed our mutual respect and transformed the emotional climate in the room. The loud strident voices, angry accusatory physical gestures, and averted downcast faces were indicative of the negative emotional energy (Collins, 2004) that permeated our science classroom.

The argument (and its resolution) highlights the centrality of emotion in the urban classroom, for it was not until the negative emotions had subsided that we were able to engage in a conversation that helped resolve our disagreement. Attention to the emotional energy is salient because emotions (both positive and negative) greatly affect the nature of social interactions, (Tobin, Ritchie, Hudson, Oakley, & Mergard, 2011) as well as the emotional climate in the classroom field. The quality of social interactions is an essential component of a cultural sociology that theorizes learning | teaching as collective social activity unfolding in communities of practice (Wenger, 2002). Emotions are central within this theoretic as they are the

glue binding people together and generating commitments to large scale social and cultural structures; in fact, emotions are what make social structures and systems of cultural symbols viable. Conversely, emotions are also, what can drive people apart and push them to tear down social structures and to challenge cultural traditions

### 5.5.2 *Emotions*

An analysis of our internal emotional states (and their expression) is complicated because our emotions are the result of the interaction between neuro-biological processes, cultural norms, and our socialization in given social groups (Turner, 2000). Thus, the wide array of emotions that we can experience and express are neither purely social constructions

nor the exclusive results of our biology. While there are countless possible emotions throughout the world's many cultures and social groups, most social theorist agree (Turner, 2005) that there are four emotions (fear, anger, depression, and satisfaction) that are universal to all human beings (Kemper, 1987). These four primary emotions are "hardwired" into the human neuroanatomy as they are vestiges of behaviors that helped mammals (and later primates) adapt to their changing environments (Turner, 2002). The congruity (or incongruity) between our expectations of a situation and our experiences produce variations in the intensity of each of these primary emotions. Thus, each of the four primary emotions varies across a continuum that ranges from low intensity (aversion, assertion, disappointment, happiness), to high intensity (fear, anger, sadness, happiness) respectively (Turner, 1999). Combinations of these variations produce the large array of first, second, and tertiary emotional states that are transacted during social interactions (Turner, 2000)

It is important to note that three of the primary emotions; fear, anger, sadness (and their variants) are negatively valence, while the satisfaction-happiness is universally considered a positive emotional state (Turner, 2000). It is necessary to note that the negative and positive valences are subject to context and culture: thus, it is possible that a negative emotion can (in certain contexts); promote positive emotional outcomes (Turner, 2005). However, in discussing emotions and emotional energy this thesis will assume the satisfaction-happiness continuum as positive emotional states, while (assertion-anger, aversion-fear, disappointment-sadness) will be considered as promoting negative emotional energies.

### *5.5.3 Emotional Energy and Collective Social Activity*

Positive emotions (and the resulting positive emotional climate) are important to our work in urban schools because positive emotions promote "feelings of membership and solidarity with the practices of a given community, while negative emotions tend to fracture solidarity and foster alienation from the work of the group. Positive emotions energize students and foster feelings of solidarity and commitment to the culture of the school science community (Olitsky, 2007). They provide the energy "for physical activity [and] for taking the initiative in social interaction and putting enthusiasm into it" (Collins,

2004, p. 107). Negative emotions reduce the level of activity, and produce social interactions that are perfunctory, listless, and passive (Collins, 2004). Negative emotions are especially damaging within the urban science classroom as they problematize negotiation | communication across difference and destabilize feelings of solidarity with the culture of the school science community.

Successful social interactions promote solidarity because people are drawn to social encounters that foster positive feeling about the self (Goffman, 1967) and one's membership in a given community of practice (Collins, 2004). Successful interactions generate feelings of satisfaction, joy, (and competence) which affirm the student's sense of belonging and increase (and sustain) their desire to engage in the ongoing work of the group (Olitsky, 2007). Ongoing successful interactions will deepen a student's self - perception (their identity) as a member of the school science community. It is this subjective identification with the culture of the school science community that encourages students to deploy all of their stores of capital in the learning of science.

#### *5.5.4 Solidarity*

Solidarity (as a subjective sense of membership or affiliation with a group's collective practice) (Collins, 2004) is essential to our efforts to create learning environments that maximize student potential, because it is the students' sense of belonging that determines the degree to which they engage in the collective activity of the community (Brickhouse, Lowery, & Schultz, 2000). The exemplary science learning that we have documented in the research literature of the DUS (Carambo, 2009), has occurred when students were committed to shared learning goals and fully engaged in activities that approbated their sense of belonging to a given community of practice.

#### *5.5.5 Parameters of Successful Whole Group Social Interaction*

Collins (2004) informs us that feelings of membership are the result of successful social interactions that produce positive emotional energy. As the positive energy increases, it engenders feelings of solidarity with the collective activity of the group. The feelings of group solidarity in turn foster positive emotions: thus, positive emotions and solidarity are both "ingredients and outcomes of successful social interactions (Collins, 2004, p.35).

Successful interactions are structured by the following four factors. The degree of success varies with the intensity of each of these parameters (Collins 1993).

- Affect, an emphasis on emotions and feelings, together with a special sensitivity to emotional cues and a tendency to be emotionally expressive
- Bodily co presence: an ecological boundary to outsiders occurs when there are physical barriers to others outside the group, or when the same set of persons continually reassembles: i.e. a small cooperative group, or a team.
- Synchrony of bodily rhythms: alignment of verbal and physical gestures occurs when participants experience bodily co presence and are sufficiently close to each other to experience entrainment of physical and vocal gestures
- A mutual focus of attention is highest when everyone is concentrating on the same event, and when each person is aware of each other's focus of attention.
- A shared emotional mood (positive or negative emotional energy) is highest when all participants share a common sentiment; it is lowest when disparate emotions are present or individuals are alienated from each other

I present excerpts from our work with redox half reactions as evidence of a successful whole class interaction (Olitsky, 2007) and a vignette working with a student as evidence of an individual interaction.

#### 5.5.5.1 A mutual focus of attention

Once the discussion is resolved, I return to the board to continue the review of oxidation – reduction reactions. I refer to the oxidation half-reaction I had already written on the board and then write a complementary reduction half-reaction. As I write the reaction, I ask the class for their input.

12:30:03	Carambo	Pointing to the oxidation reaction on the board	If this is a reaction in which you lose electrons,
12:30:04	Carambo	Pointing to the reduction half reaction	What must this be?
12:30:06	Several voices	answer:	Gain.... electrons.
12:30:08	Marissa	Speaking over the other voices	Gain one or more electrons
12:30:10	Carambo	Speaking as I write	A reaction in which an element...

		the definition on the board	
12:30:16	Marissa	Completing the sentence	Gains... one or more electrons

I take a few moments to make certain that everyone has written the reactions (and definitions) in their notebooks to avoid the difficulties that occasioned our disagreement.

12:30:49	Carambo	To the class	Can anyone tell me the reaction we wrote down on Monday?
12:30:54	Carambo	Waiting for a response	Does anyone have it in their notes?
12:30:57	Jack		What reaction?
12:30:58	Carambo		The chemical reactions I wrote on the board between copper and something else.
12:31:00	Many voices		Aluminum, copper, Al...
12:31:03	Ivory	Scanning her notebook: Speaking over the class	OH! Cu, chlorine two, and aluminum. Copper chlorine was the compound.
12:31:08	Jack and many voices join in		Yeah, copper, aluminum...

As I write down the reactants, I ask the class to determine the products.

12:31:37	Carambo	Pointing to reactants on the board	Now I told you this was a single displacement reaction. First of all... metal and liquid...
12:31:42	Marissa		Metal going to be by itself
12:31:44	Carambo	To the class	So what are we going to have over here?
12:31:48:	Jack, Marissa	Overlapping my question	Aluminum Chloride three...

Once the class has identified the reduction and oxidation half reaction, we balance the charge of each half reaction by adding electrons to the corresponding side of the equations. As we continue balancing the reactions, the focus of attention is on the notes I am writing on the board. Our physical and verbal synchrony is evidenced by the facial gestures and bodily positions as students carefully listen to and write down the notes on the board. The many quick, simultaneous responses to my questions, and overlapping speech, provide proof of the verbal synchrony existing in the class.

## 5.5.5.2 Shared emotional mood



Figure 5.6 A shared positive emotional mood

Students ask clarifying questions about the notes, but others make comments that are humorous and evoke laughter in the room. As I write on the board, my facial expression evidences the emotional mood in the classroom.

## 5.5.6 Co teaching with Mr. Chris

Before completing the work, we have to reconcile the charge of the overall reaction as we have used different numbers of electrons in each half-reaction ( $2e^-$  for the reduction and  $3e^-$  in the oxidation). I point out the discrepancy to the class.

12:45:37	Carambo	Speaking to the class	I think we have a problem here
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As I speak, I make eye contact with Mr. Chris. He nods that he understands where the lesson is leading us, and asks (a silent non-verbal question), if we are going to address the discrepancy in our work. I respond verbally.

12:45:41	Carambo	Nodding to Mr. Chris without pausing	Yes I think I want to go there
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Mr. Chris gestures that he understands my intention and quickly moves to the front of the room. As he comes forward, I move to my right and away from the board. The exchange is seamless and evidences the synchrony of our coteaching relationship. Mr. Chris moves to the center and pointing to the board begins to explain the discrepancy in our work.

12:45:50	Mr. Chris	Pointing to the reactions on the board	See the reaction and see what we say happened?
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12: 46:00	Mr. Chris		The Al lost electrons and copper gained electrons. Right?
12:36:10	Mr. Chris	Pointing to the Al half reaction	How many did aluminum lose?
12:46:12	James		Three
12:46:13	Mr. Chris	Pointing to the Cu half reaction	And how many did copper gain?
12:46:14	Multiple voices		Two...
12:46:15	Mr. Chris	Twirling his fingers in the air	So there's an electron missing, right?
12:46:19	Mr. Chris	Pointing again at the Cu half reaction	There's an electron missing in this equation, right?
12:46:22	Mr. Chris		Is there an electron missing in this equation?
12:46:24	Multiple voices		Yeah... yeah... there's none there...
12:46:28	Mr. Chris		So where did it go? (Pauses waits for class response)
12:46:34	Mr. Chris	Still waiting for a response	It had to go somewhere, right?
12:46:38		As Mr. Chris speaks I rewrite the half reactions one above the other in the center of the board. As he speaks, he gestures to these resources.	
12:46:39	Mr. Chris	Gesturing the new writing on the board	So we need to mess with these equations until we have the same number of electrons gained and the same number lost. We need to "tweak" them until the numbers are the same.



**Figure 5.7 Mr. Chris and I Coteach**

We then show the class how to manipulate each equation so the number of electrons produced at the oxidation half reaction equals the number consumed at the reduction half reaction. We work effortlessly as a pair until the class understands how to multiply each

half reaction so as to balance the charge of the overall equation. Our gestures and talk are rhythmically connected and fluid as our coteaching by this point in the year is seamlessly coordinated (Roth, Tobin, Carambo, & Dalland, 2005). Our work together communicates the admiration we have for one another and demonstrates a genuine enthusiasm for the learning of chemistry. Our interactions are collegial, supportive and they add to the positive emotional energy and solidarity in our classroom as students see not one, but two teachers working for their benefit.

#### *5.5.7 Coteaching as Structural Resource*

This thesis has sought to determine the requisite structures that enable the agency of all participants in the science classroom. At several points in this thesis, I have stated that coteaching was an indispensable resource in my development and in the transformation of the SET small learning community. Coteachers were crucial to my development because they allowed me to work closely with my students and provide them the resources they need to be successful learners. During these encounters, my students and I were able to create the relationships that engendered trust and mutual respect: this would not have been possible without the presence of coteachers. The latter moments of the discussion with my students provide evidence of the importance of coteachers in the urban classroom.

Earlier in this lesson, Mr. Chris helped diffuse the argument and reconcile our differences as he took the lead at several points during the discussion. His input provided a third point of view on our disagreement, and allowed me the time to speak with individual students and more fully understand their difficulties with the homework assignment. At several key points in the lesson, he took the lead and provided important additional insights on redox chemistry. The final step of reconciling the overall charge was difficult for many students to grasp, however Mr. Chris's seamless and immediate entrance provided the additional insights needed to fully explain the chemistry content. With his assistance, I was able to complete the difficult task of reconciling the overall charge of the redox reaction: without him, few of the day's successes would have been possible.

## 5.5.8 A Successful Interaction: Jack and I Add Fractions

Although many students have understood the concept of balancing the half reactions, many have difficulty with the method we used to determine the coefficients in the aluminum– copper nitrate reaction. I suggest that we look at the addition of two fractions ( $1/2$  and  $1/3$ ) as a way to understand the mathematics involved. I ask for a volunteer and Jack accepts to be the teacher. Fractions are seldom an exciting topic for students, however the collective positive emotional mood and enthusiasm in the class provide the opportunity to teach the class how to find the least common denominator for these fractions.

12:53:45	Jack	Motioning to me	Can I? Can I do it? Can I do it up on the board?
12:53:49	Marissa	Over the class	You got to find the least common denominator
12:53:50	Carambo	To the class	Which is?
12:53:51	Many voices		Six...
12:53:54	Jack rewrites the fraction on the board. Has trouble figuring out what the next step should be		
12:53:57	Jack	To himself	Now two and three both go into six. So. ah... (Jack hesitates a bit, as he is not sure what to do next)
12:54:00	Jack	Speaking to me	This is right.. this is right
12:54:04	Jack	Smiling broadly to the class	So what time two equals six?
12:54:08	Marissa	Over the top of the class	Two goes into six three times and three goes into six.
12:54:09	Marissa	Answering own question overlapping Jack	Two times.
12:54:12	Jack	Speaking to the class	So... and what times two... goes into six?
12:54:13	Class	To Jack	Three, three, three...
12:54:14	Jack	Continues to have difficulty: Raises hands and shoulders to signal his need for help. I move over to help: we both have chalk in hand as we write out the rest of the problem.	

The encounter with Jack exhibits components of Turner's successful interaction and increases the positive emotional energy in the room. As he and I work at the board, our physical location separates us from the class, which creates an ecological boundary between us and the other students. Our shared emotional mood is jovial and humorous as we have had a long history together and we genuinely respect and like each other. Thus, we share a great deal of satisfaction working together. There is much laughter and joking

going on which adds to the positive emotional energy in the room. Figure 5.7 evidences our close physical proximity and our mutual focus of attention on the fractions I have written on the board. There is a high degree of physical and vocal synchrony as we each take turns calculating the equivalent fractions.

		To Jack:	
12:54:16	Carambo	Pointing to each fraction in turn	Multiply top and bottom by three and three Now do top and bottom by two.

I write the numbers next to the fractions and Jack performs the multiplication and writes in the denominators to each fraction.



**Figure 5.7 Jack and me at the Board**

During our time at the board, many students (Marissa in particular) are shouting instructions we complete the addition of the two fractions. We finally add the fractions which serve to illustrate the mathematics we used to balance the two half reactions. Once we complete the addition, we review the method we used to balance the half reactions. Our work at the board has proven successful as many more students are now able to understand how to reconcile the overall charge of the two half reactions.

#### *5.5.9 Contradictions Persist*

Although the outcome of the class were mostly positive, analysis of the videotape showed many students putting their heads down, not paying full attention, or simply not engaged in the classroom discourse. While Ivory, Marissa, and a few others successfully learned the concept of redox chemistry, many others failed to do so. Though events in our community were encouraging, the disengagement of many students troubled me. Given

the relative successful nature of the environment and our many resources, what could be done to fully engage these students? Research undertaken in our learning community had suggested using student interests as a means to increase engagement and motivation for the learning of science. Several resources available to our community helped me structure teaching units that would respond to student interests. The following published manuscript documents my efforts to discover how to fully engage all participants of the classroom in the learning of science.

## 5.6 THE CENTRALITY OF STUDENT PARTICIPATION<sup>15</sup>

### 5.6.1 *Changing the Classroom Structure*

#### 5.6.1.1 **Video Analysis: Chemistry Class: *December 8, 2001***

It is early in December of the school year. I am watching video tape recordings of my chemistry class. We are discussing the science content and procedures for a lab on the solubility and the polarity of compounds. The lab activity is structured so that students first observe the solubility of salt and naphthalene in water, turpentine, oil, and alcohol and then use electronegativity data to determine the type of bonding that characterizes each of the solutes and solvents. It is my hope that they will discover the connection between the nature of the intermolecular forces and the differential solubility of ionic and non-polar substances. The laboratory will end with a challenge that requires that students to explain the solubility of food coloring when placed into mixtures of polar and non-polar solvents. As I continue with the mini lecture, I am pleased to see that the class is easily managed. Although these are the same students that proved so difficult during my first year at City High School, my status in the community has grown to the point where I have few behavior or management problems. Whenever a student speaks out of turn or engages in inappropriate behavior, a slight look or a word is enough to stop him or her. Once instructions are over, we set out to do the lab. The students arrange themselves around six large worktables that serve as lab stations. I have set the materials out on the preparation table and I assist as each

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<sup>15</sup> The following text is from a published manuscript. As a result, the formatting of tables, dialogues, and figures differs from formatting used in other chapters of this thesis.

group sends the “materials person” to the table to get equipment for the lab. Although we have discussed the lab, and each table has several copies of the instructions on it, I notice that the groups fail to begin the lab. The procedures seem to confuse them and they cannot figure out what to do. They sit idly at their workstations, “joke about,” toy with the pipettes, and call out to me for help. I am called from table to table for instructions as students complain, “I don’t get this!” “This is confusing,” or “What do we do next?” Some attempt to work, but they mix substances without paying much attention to the lab procedures. When I approach a group, the situation improves somewhat; I review the concepts and procedures, organize the division of labor and the materials, and encourage students to continue. They then begin to work, however a few moments after I leave, the group falls into listlessness once again. The class continues in this fashion for the remainder of the period. I continue to move from group to group encouraging and explaining. However, no student is able to fully make the connection between his or her observations and the type of chemical bonding, nor can anyone explain why the food coloring settled in the polar layer of the mixtures. This quality of engagement is unproductive, as I must provide all of the energy. Although the students behave relatively well, they do not invest the kind of intellectual and personal energy needed to construct important concepts on their own. The quality of the work in this lab is so poor that there is little possibility of using the activity as a basis for understanding the behavior of polar and non-polar substances.

I am perplexed by the lackluster quality of their work because I know that these students are resourceful, intelligent, and energetic. Why then is their work devoid of any personal commitment to their learning? Given the rapport that existed between us, I wondered how I could foster the kind of learning environment that would encourage them to fully engage in their learning. This chapter is an account of our efforts to structure learning environments that would allow all students to fully engage in their learning.

### 5.6.2 *The Labs at Penn*

It has been some time since I have had serious disciplinary or classroom management issues. Given the positive nature of my relationship to these students, I had assumed that I would be able to foster the kind of learning environment where students would be active participants in the creation of their knowledge. However, events in my chemistry class this year showed that this would not be so easy. As I watched other videos of my class sessions, I realized that most of the students wanted to engage, but some structural element was impeding their ability to do so. Research that had been recently done at CHS suggested that students responded positively when their suggestions were used in the creation of science curriculum (Seiler, 2002) or when the science content related to pertinent issues in their lives (Barton, 1998). With this in mind, I asked my chemistry students for a list of topics or questions that they might wish to explore in their chemistry class. We used the lists to cooperatively design a series of activities and laboratory investigations that we would carry out as part of our chemistry curriculum. The nature of some of the labs presented a problem as they had an organic focus and our school has neither the chemicals nor the facilities to perform organic chemistry. We were fortunate to have access to a local university's chemistry facilities. Since I could not leave school during the day, our student teacher (Mr. Chris) volunteered to teach the labs. We selected a small group from the class to go to the university twice a week to perform some of the requested experiments. (See Table 5.1 for a full list of the laboratories). The remaining questions and topics were to be covered as part of our regular class time. Alternate Friday mornings were used as a time of reporting what was learned.

**Table 5.1 Labs at Penn**

Synthesis of Aspirin
Acid Base Titration
Making Soap
Christmas Candy
Separation of pain relievers using chromatography
Extraction of Caffeine

Videotapes of the labs done on the university campus showed an improvement in student attention to laboratory procedures and the use of equipment. Our analysis also showed an

increased ability to personalize the science content and complete laboratories on their own. An example can be seen in a short vignette of the laboratory on the synthesis of soap. The video shows one student making fun of himself on camera. He purports to be a “gangsta chemist” who is working with deadly chemicals for heinous purposes. He “toys” with the deadly sodium hydroxide and feigns an explosion while attempting to light the Bunsen burner, and takes the camera person on a tour of the secret materials located in the laboratory.

#### 5.6.2.1 Identity at the Labs

Although it seems that these behaviors may have detracted from his ability to learn from the lab, the student was able to successfully complete the procedure for the synthesis of soap during the allotted time period. He also helped other students with the procedure, mastered the use of the flint striker and the Bunsen burner before anyone else, and engaged the student teacher in an argument over the best method to increase the yield of the product. In watching the videotape, I noticed that all of the students had a better grasp of the laboratory. There were relatively few procedural questions, as they did not seem confused about the equipment or materials. They showed genuine curiosity about the chemicals and their work. Although there were many jokes and side conversations, they were no behavioral or management problems and they were on task for the entire laboratory. What struck me as most interesting was that they seemed to genuinely enjoy themselves. The videotapes of two other laboratories revealed similar patterns in terms of students’ levels of engagement and personal energy. Students reported that the labs were “fun,” and that they got to learn in interesting ways.

#### 5.6.2.2 Learning at the Labs

Mr. Chris	So what did you learn?
Pierre	We learned but we learned but we learned to play with things in a certain way. We learned to play, that’s another way of learning.
Mr. Chris	So what did you think of the Antacid Lab?
James	I actually did like that one, the next day when we got back to school and we were able to figure out which one was cheaper, so we could actually know which one worked best and was worth the money.
Mr. Chris	So what was your favorite lab to do?

James	The Candy lab. We got to do what we wanted to do with the candy, we got to mix our own ingredients, and mix stuff in. Our candy came out better than anybody else's.
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The behavior of the students in the university labs also demonstrated that incorporating student interests in the planning of the curriculum was a positive step toward improving the nature of engagement during laboratory activities. I wondered what distinguished these activities from those occurring in the classroom. The structure of the labs was one in which the students were working on concepts that they had chosen, all of the necessary resources were available, and the learning served a purpose that they could easily identify. The tapes of the labs showed learners who were using their creativity, intuition, and intelligence to pursue goals that were of importance to them. Importantly, they seemed to be enjoying the doing of science. From a sociocultural perspective, the structural characteristics of the learning environment (in this case lab resources and equipment, and topics chosen by students) and the practices of the students within the environment illustrate the dialectical relationship that exists between structure and agency. Sociocultural theory suggests that learning occurs within social systems and it is the structure of those systems that interconnects with the agency of the actors within those systems. A given structure can afford student agency or it can limit or preclude the attainment of goals. In viewing the student-suggested laboratory activities, I finally saw the energy, engagement, curiosity, and natural intelligence that were not obvious in other day-to-day classroom activities. What had changed was the structure of the learning experience, and this structural change had afforded the agency of my students.

Although the labs appeared more successful, I had no method of assessing the nature of student engagement. The students looked as if they were doing “better” but how could one assess their actions? Interestingly, their actions in the lab did not seem to foster a greater understanding of the science content. When the students reported to the class each Friday, the nature of their science talk was not improved. The structural changes of involving the students in the creation of the curriculum was a positive first step, however it had not produced the kind of classroom engagement, or the quality of science discourse that I had envisioned.

### 5.6.3 *The May Projects - 2002*

The opportunity to explore these issues presented itself, this time in a biology class, near the end of the school year. The latter weeks of May until the middle of June, is a time between finals and end of the year activities. It is a time that is traditionally open and involves less structured instructional activities. I decided to use this time to create learning units based on student interests. Once again, I asked the students for their suggestions of topics that interested them. However, this time, I suggested that topics could be from any area of science. I introduced that particular change since, in my first class, the chemistry students had told me that restricting their choices to just chemistry had limited their selection of activities and they would have preferred to be able to choose any science topic. The students and I negotiated a series of activities that they felt would challenge and engage them for the remainder of the year. Students in all of the groups were responsible for a daily log and a final report that summarized what they had learned during the projects.

**Table 5.2 The May Projects 2002**

Chemistry of sugars and fats
DNA electrophoresis
Building rockets
Growing Fast Plants©:
Raising frogs from live eggs
Dissections: comparisons of the anatomy of five different organisms
Building with K-nex: the roller coaster and Ferris Wheel

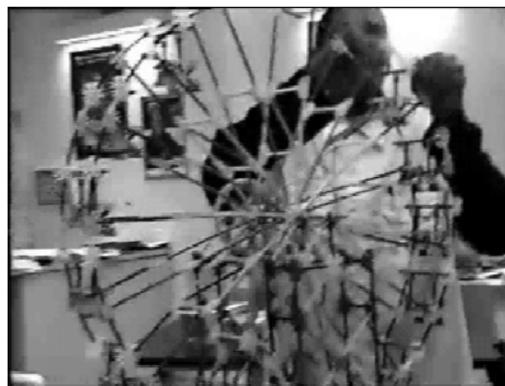
The projects illustrated the principles of conservation of energy and momentum as well as relationship between potential and kinetic energy. Students interested in DNA wanted to know how forensic investigators use DNA evidence to solve crimes or parentage issues. They explored the process of separating DNA fragments using Agarose Gel Electrophoresis. They learned how to mix buffer solutions and cast gels. Prepared DNA samples were centrifuged and delivered into the gels using micropipettes. Electrophoresis apparatus was used to separate the samples into fragments of differing lengths. Once the gels had run for the required length of time, they were removed from the buffering

solution and stained with methylene blue dye. Students interested in dissection compared the anatomy of different types of animals. Students picked one organisms from at least two different taxonomic classifications and compared the respiratory and circulatory systems. Most chose to compare the frogs (amphibians) to grasshoppers and crayfish (arthropods) while some students compared starfish (echinoderm) to earthworms (annelelid).

The following photos are examples of some of the activities. Figures 5.9 and 5.10 are of students at work on a roller coaster and a Ferris wheel using the K –Nex© kit. Figure 5.11 is of the members of the dissection crew preparing for the dissection of the frog heart: Figure 5.12 shows a member of the DNA crew in the process of delivering a DNA samples into prepared gel in the electrophoresis apparatus.



**Figure 5.9 Clarissa at the Roller Coaster**



**Figure 5.10 Wayne at the Ferris wheel**



**Figure 5.11: The Dissection crew**



**Figure 5.12: The DNA crew**

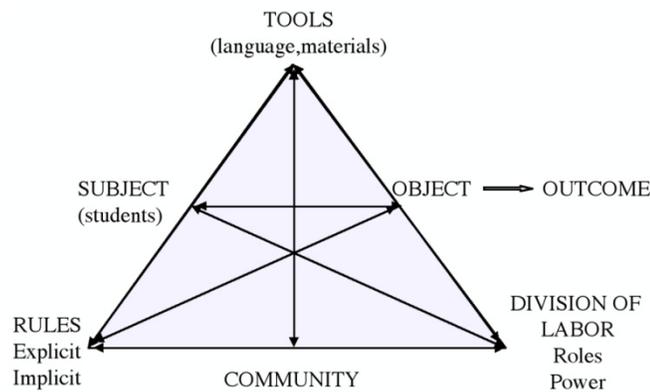
### **5.6.3.1 Video Analysis: The Dissection Crew: *May 19, 2002***

The video tapes of these activities showed levels of student engagement similar to what had been observed in the labs done at the university, however two groups: the “DNA crew” and the “dissection crew” (students in figures 5.11 and 5.12), displayed remarkable levels of motivation, perseverance, and creativity. In these groups, the nature of their conversations as they used the science content to discuss their observations and solve problems evidenced a high degree of scientific fluency. The dissection crew consisted of students who were among the lower achieving and usually less motivated students in the classroom, yet they remained focused and on task for many days with little encouragement or guidance on my part. Jarvis was a member of this group. The nature of his science talk with others and me suggested that he had constructed a deeply personal and accurate grasp of the anatomical differences between mammalian and amphibian circulatory systems. The ensuing analysis focuses on his efforts to dissect the frog heart and his exemplary display of scientific fluency.

## **5.7 JARVIS AND THE DISSECTION OF THE AMPHIBIAN HEART**

### *5.7.1 Cultural Historical Activity Theory*

To understand Jarvis’s actions, I turned to Cultural Historical Activity Theory (Cole & Engeström, 1993); hereafter referred to as activity theory). Activity theory provides a means to understand the activities of people as they attempt to transform given circumstances or objects into artifacts that suit their immediate or long term needs. Activity theory suggests that living organisms engage in actions meant to achieve particular goals. A classroom is composed of many individuals seeking to meet personal and collective goals. While some goals can be achieved more directly than others, most activities are characterized by the use of mediating tools as a means to achieve goals. The use of these tools is subject to the rule structures that govern the actions of the individual subjects as they pursue their goals alone or as part of a given community, where the work is divided among group members.



**Figure 5.13 Cultural Historical Activity System Matrix**

The activity system matrix (represented in figure 5.13) can be used to analyze how a given individual (or a community) achieves goals within a specific social system. Each of the nodes of matrix represents a structural component of the field that can enable or constrain student agency. The matrix facilitates the identification and resolution of those contradictions that emerge as an individual (or a group) strives to achieve goals (the object of the activity system). It can also identify contradictions that arise if the goals of an individual (or small group) are counter the community's collective goals. Contradictions can also arise if individuals follow different rules from those that are negotiated by the community, engage in a unique division of labor, or access cultural resources, that differ from those normally appropriated for that activity. Any of these contradictions can truncate the agency of the individuals within the activity system. Thus, contradictions serve as points from which patterned practices within the classroom can be recognized and change can be initiated. In the following sections, I use activity theory in my analysis of the actions of Jarvis and the dissection crew at each node of the activity triangle.

### *5.7.2 C.H.A.T Analysis of Jarvis and the Frog Heart*

The subject of this analysis is the student Jarvis; the community is the classroom, and the goal is the dissection of an amphibian heart. The rules are those negotiated by the teacher and the students; they detail the safe use of the dissecting tools, respect for the organisms being dissected and traditional norms of classroom behavior. The group members determine the division of labor. The learning outcome is scientific fluency as evidenced

by the use of tools, achieving of the goal and the quality of scientific discourse used to explain the activity.

**5.7.2.1 Video analysis: Jarvis dissects the frog heart: *May 21, 2002***

It is an afternoon in late May. The students in the fifth period biology class noisily enter the room and move to their projects. We are well into the May projects and each group is in the midst of an activity. The work this day will be the completion of the Ferris wheel, the DNA crew's electrophoresis and the dissection crew's continuation of their comparative anatomy. The DNA crew is running a DNA sample in a gel they previously prepared. The dissection crew will divide in half. Half the group will work on a grasshopper; the other will work on the frog. The group's goal will be the comparison of the hearts and lungs of the organisms.



**Figure 5. 14 The DNA crew dissecting the frog**

We establish where each pair of students will work and then set about distributing equipment and supplies. Kareem, Maize, Nedwin, and Jarvis decide that they will all initially look at the frog, but later Maize and Kareem will move off to other organisms leaving Jarvis and Nedwin to complete the task. While I go to get gloves, Maize and Kareem start to joke and flirt with each other. Jarvis however is not interested in their banter. He is concentrating on the frog and states, "I know all about this, want me to show you all?" Kareem and Maize do not respond but Jarvis is not deterred; rather he stays focused on the frog pinned to the dissection pan. I arrive with three sets of gloves,

which go to the two young women and Kareem. Jarvis is left without the necessary equipment. This is an early contradiction in the activity system, as Jarvis does not have access to necessary tools. Without the gloves, his work is hampered. He says to me, "I need some gloves." There are no more in my room and so I have to leave the room to get gloves from an upstairs supply closet. Jarvis leaves the table and strays out of camera range, but as soon as I return to the room, he approaches me, gets his pair of gloves, and moves back to the table. One of his partners has already started the dissection, however she is having some difficulty getting the heart out. Jarvis challenges his peers saying, "I bet you I can get the heart out." He takes center position in the dissection and begins to work to get the heart out. Nedwin, Kareem, and Bruce (a visitor from another group) surround the dissection tray. Each one of them is helping, one holds the tray, another provides tools, and another is looking at the dissection guide.

Bruce (the visitor) realizes that he is not wearing goggles and so he reaches for a pair. Jarvis taunts him "Got scared, got scared?" They all laugh at Bruce, and then continue to work. They are abuzz with observations about the amphibian, the color, the smells, and the size of the organs. One student disbelieves that there is any blood left in the animal, another wonder if it is male or female. They continue to work and joke with each other, all the time focused on the amphibian's odd organs and the task at hand. At one point, Bruce bemoans the fate of the poor frog, the life that he had, how he died. More laughter ensues, yet the focus of each person remains on the dissection tray; the heads remain bent, all hands are near or on the dissection pan, and there is no break in concentration. The community has spontaneously aggregated. I did not establish it, yet there is a very clear division of labor, the goal has been tacitly agreed upon, they follow a clear set of rules of safety which suggest how to work together and use the tools (very sharp scalpels, probes and scissors) effectively. Throughout the task, they remain playful and energetic. When logistical problems arise, one student moves to the dissection guide or the computer, others adjust for his absence and the dissection continues. No obstacles arise. Finally, after about 25 minutes, Jarvis announces, "I got the heart out Mr. Carambo." Bruce sings a song about the heart, and he and Kareem share a private joke and move away from the table: Jarvis and Nedwin do not move. At this point, the most fascinating event takes place. Jarvis takes the heart from the dissection tray and states that he needs a

magnifying glass and another tray. His goal has now become the dissection of the heart. He wants to compare it to the sheep heart that was dissected several days earlier.



**Figure 5. 15 Jarvis dissects the frog heart**

This goal is different from what we had previously discussed, since his goal is now an internal examination of the frog's heart. He needs another tray as his partner has continued with her exploration of the frog's skeletal and muscular systems. The magnifying glass is needed because the organ is so tiny. As I am involved with other students, Jarvis moves to the supply cabinet, retrieves the necessary equipment, and returns to the table. This is most impressive from a structural perspective because not only is Jarvis aware of the resources that he needs, he is able to access them of his own accord and use them in the fulfillment of his own set of goals. At other times, the immediate lack of equipment might have created a contradiction or allowed him to become unfocused yet in this case he perseveres in his task. As he returns to the table, he passes in front of the camera and say, "Time to go to work." Jarvis works furtively for another 10 to 12 minutes, but then calls me over. "Mr. Crambo I can't cut it cuz the scalpel won't cut it." He is having trouble since the dissecting tools are not fine enough, the heart is too small, and he needs some help. I provide him with the tools from an instructor's dissection kit and we plan a new strategy. The students use the knowledge they have gained during the dissection of the sheep heart, along with their familiarity with the dissection tools to plan their procedure. Jarvis will make the incisions and Bruce and I will serve as his assistants. Bruce holds the tray and the heart in place, while I hold

the magnifying glass. Jarvis continues to work at opening the heart. He identifies the top of the heart and orients it so that he can identify the left and right sides. As he opens the organ, he sees what appears to be blood. He remembers that earlier Bruce had doubted that blood could be present in the frog's heart. Jarvis announces, "I told you all there was blood." The organ is quite small, but he perseveres. When he succeeds opening the heart, he exclaims, "Got it! Got it! You, I'm the true...." I am called over to inspect.

The heart has been expertly opened. The conversation immediately turns to whether it is chambered like the sheep's heart or different in structure. Jarvis tightens his gloves and exclaims, "That's what I'm about to find out." This is yet another self generated goal. It is now nearly two thirty; they have been working continuously for over an hour with almost no teacher input or motivation. There have been no distractions; every time a goal has been reached, a new one has surfaced. During this last conversation, I become central to the table and the discussion. This happened accidentally, yet it is interesting to note how Jarvis reasserts his centrality. He takes the magnifying glass, probes out of my hands, and regains control of "his" dissection. I realize this and move to the side. Jarvis then continues to work alone: he does not need me. Once the heart is opened, he examines the chambers, identifies each one, and relates their structure to the respective function within the sheep's heart.

Carambo	Looking at the heart in the tray	Can you remember the sheep heart that we did, can you tell which side's the left which side's the right?
Jarvis	Gesturing with the probe	This the bottom,
Carambo	Gesturing with his fingers	That's the bottom,
Bruce	Pointing with his probe	The top is
Jarvis	Indicating as he speaks	This the left, this the right
Carambo	Speaking to both students	Why is that the left side? Because it's... Which side of the heart is bigger or smaller?
Bruce	Answers directly	This side is bigger. Because we pointed it out the other day
Carambo	Still questioning	Which side of the heart is bigger or smaller? If it's a pumping heart like ours?

Bruce	Not certain of his response	The right side is the biggest; the left side's the smallest.
Carambo	Asking Jarvis	Well which side pumps to the rest of the body?
Jarvis	Not certain of his response	What side? What side pumps to the rest? The left, The left side
Bruce	Overlapping Jarvis: certain of his answer	You talking about the ventricles right? The left ventricle is the one that pumps,
Jarvis	Agreeing quickly	Yeah, it's the left
Carambo	Gesturing to the heart	So if it's the same as the sheep heart then maybe we could say this might be the left side. Now how we cut? We cut the sheep heart like (gesture) like yo...we could cut it like this.
Jarvis	Gesturing with his scalpel	You want to cut it down the middle
Carambo	Suggesting a different incision	No, I would cut it, why don't you cut it...(gestures).
Jarvis	Disagreeing, gesturing to himself as he speaks	This how I'd cut it ... In my professional opinion...
Carambo	Looking at Jarvis, slightly surprised	You want to cut it down the middle?
Jarvis	Indicating his plan	We could cut it like down the side... like a book

It is now close to 3:10 and the period ends. The crews begin to clear their workstations and the class ends. As we clear the table, Jarvis and I have a few minutes alone. We do not discuss the success of the day; rather we are looking at the frog's skin. It is at this point that I have a few minutes to "teach" about amphibians. Jarvis still has a few questions that he could not answer. He's curious about the difference between the sheep and the amphibian heart and why the lungs seemed so small. He is still curious. For these last few minutes, I answer his questions and help him fill in his missing information. Finally, it is time to go home so we stop and leave the rest for tomorrow.

### *5.7.3 Analysis of Jarvis' Activity*

Jarvis's actions during the course of the dissection activities were those of a highly motivated and engaged student. His use of the dissection tools, requests for additional resources, and his ability to analyze the structure and function of the two hearts provide evidence of his scientific fluency. While these events were encouraging to me as teacher,

they presented a disturbing contradiction because Jarvis's academic grades prior to the May projects were so low that he failed the year's biology class: he matriculated to his senior year only after completing the course in summer school. While the projects suggested that including student interest fostered the use of student cultural and social capital to pursue relevant and important learning goals, Jarvis had been unable or unwilling to invest himself or his cultural capital during the year's regular course of study. In order to understand why this occurred, I invited him to view the videotapes of his activities in the dissection crew and share his perspectives on himself as student, on school and on the role of teachers. Following are excerpts from our conversation followed by my post conversation comments.

#### *5.7.4 A Conversation with Jarvis*

Initially, I found it odd that Jarvis would see no difference in his behavior as a member of the dissection crew. In retrospect, I understand that Jarvis was viewing himself, as he knew himself to be with all of his social and cultural capitals at play. While dissecting, he was funny, cooperative, enjoyable, sociable and very playful: qualities that often served to take him away from learning goals as he pursued other more important personal goals. During the dissection activities however, all of these (historically distracting) qualities were at the service of a learning goal that had captured all of his faculties. To the outside observer, it looked as if a different kind of student had emerged. The reality was that Jarvis had found an environment in which he was free to invest his entire persona. The Jarvis that I knew was devoid of these natural sources of energy and motivation; hence, he was often an uninterested unengaged student in our classroom. I reminded him of this, as I still needed to understand why the dissection activities had had such an impact on his behavior.

Crambo            I remember that in this class, sometimes you would mess around a lot and you would get drawn off, and you'd be hanging out with people and goofing around, but this day I didn't have to say anything to you, and every time you had a chance to goof off you didn't

Jarvis            This [the dissection] was different because I was real interested in this right here

Carambo

This really interested you. Did you always want to do dissections; did you always want to cut things open? What was so interesting about this?

Jarvis For real? You, like how you was asking everybody what we wanted to do and everybody was suggesting and I was like the only one out of, like I was the only one out of four, it was like me and three other people out all the classes that wanted to do dissections and you agreed and we were talking about it, and I was very interested and like I couldn't wait, this right here, this really interested me

It was clear that the dissections had captured his enthusiasm, but I wanted to know how to create similar enthusiasm in all of our science classes. Jarvis suggests in the following exchange that it was his ability to pursue a topic of his own choosing, and the respect that was accorded to his interests that made this activity different from regular science classes.

Carambo If you could give me some advice on how to make classes good for students, what would you say? What would you do? How would you make school more interesting? What would you do?

Jarvis It's got to do with the teachers, to me first, it's all right for the teacher to come in and get straight down to business, do whatever they got to do, do whatever he's supposed to do to teach the kids, but sometimes you got to get the kid's opinions, cuz that's why we go to sleep in the class and do all unreasonable stuff

Carambo Cuz we don't listen to you: So find somewhere in the middle, [meet halfway] what happens if we're in the middle and we can't do what you want to do? What would happen then? How could we make it work ok then?

Jarvis If you can't do [all] what we want to do then you can put a little, you know you could put a little bit in your lessons that interests us, about our suggestions that we gave to you, that way teacher and student could communicate and they have a better relationship, you know between the student and teacher, then the student would want to do his work

Carambo Would that make you feel more like a partner in the whole thing? If we could put a little bit into our lessons, how would that make you feel?

Jarvis It would make me feel more interested in the work

Jarvis's perspective was understandable, however the reality is that teachers are not always able to incorporate student interests into their lessons. It is also true that power inequities within most urban schools are such that students (and teachers) have little control over the curriculum in their classroom. I asked Jarvis's opinion on this reality.

Carambo	Do you feel like you have no power or control over what goes on in class? How do you feel?
Jarvis	You really don't have no power, you know, some people, some teachers say the teachers don't even have no power, they got to go by what they get, that's like true, but they still don't go, some teachers don't go by the lessons that they have to give to us, they do whatever they want to do so, why can't we both communicate with each other and maybe you know class would be a lot better.

The May projects had proven quite successful as all of my students were able to complete their projects and many (like Jarvis) had displayed remarkable scientific fluency. Jarvis however had failed the class and would need to attend summer school. His failure troubled me as he had shown such perseverance and intelligence during his project.

*5.7.5 A Positive Year: Contradictions Persist*

This year was a pivotal year in my development as urban educator and in the transformation of our learning community. The several disagreements that occurred had (while discomforting) reaffirmed the centrality of respect and the importance of communication | negotiation with my students.

The argument with Ya-Meer highlighted the importance of identity and how our subjective sense of self can constrain (or enable) the agency of participants in the classroom field. The argument was particularly instructive as it was my assumption that his cultural identity was similar to that of my other students that occasioned his anger. Our cogenerative dialogues helped me to fully appreciate his emerging identity as a high achieving student and reaffirmed the dangers in assuming that all students from a given socioeconomic reality would have similar cultural perspectives. There would be one other cultural assumption that would occasion a similar contradiction in my praxis, however that would become evident in the coming year.

The resolution to the argument with Ya-Meer was vital to our community's continuing transformation because it established the cogenerative dialogue as a means to respectfully resolve conflicts. Ya-Meer's use of various teachers and coteachers in his cogenerative dialogues affirmed our staff's commitment to fully honor our students' voices as equal coparticipants in our learning community.

Similarly, the argument with Ivory firmly established the respect I had for my students. The cogenerative dialogue with the class allowed me to fully explain my perspectives while acknowledging my understanding of their difficulties with my teaching style. Although there was a high degree of anger on both our parts, our community had changed considerably since the early months of 2000 when such a discussion would have occasioned greater disruption and possible physical altercation. This transformation was the result of the many efforts of our staff to communicate respect and build trust through ongoing discussions with our students. Our communal interdisciplinary approach to teaching, the variety of resources that supported student learning, and our efforts to negotiate equitable resolutions to classroom conflicts created a climate in which conflicts could be more easily resolved. Our efforts on our students' behalf, communicated our genuine respect and desire to provide them a rigorous, challenging education. It was the combination of these aspects of our interactions with our students that had occasioned the transformation of the SET small learning community.

Jarvis's failure as a student in light of his fluency in the dissection would remain as a troubling contradiction. Although we had structured his activity with his input, interests had not been enough to create a long lasting sense of identity or affiliation with the work of the school science community. Although our cogenerative dialogues had provided me insights into his perspectives, his exemplary work on the dissection had come too late. When our community moved to a new floor, Jarvis would transfer to another community. There he would experience many difficulties and fail to graduate with his class. His failure as student remains a troubling contradiction within the history of our learning community.

### **5.8 A CHANGE TO A NEW COMMUNITY**

During the summer months of 2002, my coordinator and several teachers from our learning community were transferred to the learning communities on the third floor of our school. Our new home was formed by joining two smaller communities, (know as Motivation and Magnet), into the Science Engineering and Mathematics academy (SEM). Our principal had proposed the change to this new floor because our efforts in SET had

proven so successful. The hope was that we would foster a similar transformation in these communities.

The combination of two distinct teaching staffs and two differing student populations occasioned a series of contradictions in the school's organizational field (Roth W.-M. , 2005), which necessitated continual adjustment of student rosters, teaching assignments and administrative procedures. Thus, the first months in our new academy were dedicated to solving structural impediments that constrained teacher practices and slowed our efforts to build the SEM academy. We were aided in this effort by our school administration and the array of resources that had assisted us in the SET community, thus by year's end most of these problems had been resolved and I and my fellow teachers were able to focus all of our attention on the curriculum in our classrooms.

Given the emphasis on science and engineering, many additional structural resources were made available to us, along with an expanded number of coteachers and additional science staff. I was assigned to two rooms that I combined into one large classroom that served as classroom and laboratory. I also had access to two large science laboratories and a full time lab-assistant. My ongoing association with a local university provided access to laboratory equipment, chemicals, and supplies. Additionally, two student teachers were assigned to each of my chemistry classes. Working collaboratively with my student teachers, my coordinator, and university co researchers, I was able to use the wide array of resources to structure a rigorous, challenging science curriculum for our students. Thus by the first months of 2003, my chemistry classes had all of the requisite resources to become truly exemplary learning environments.

My classes in SEM were what many considered "model" classes because they were the well managed, learning environments. Although there were occasional misbehaviors, my social capital was such that students rarely misbehaved in my presence. The combination of a well-structured curriculum, a large well equipped classroom, and respectful well-behaved classes suggested to me that I was finally a successful urban educator: such was not the case as many hidden contradictions remained.

CHAPTER SIX:  
EXEMPLARY SCIENCE LEARNING

**6.1 CONFESSIONS OF A SUCCESSFUL SCIENCE EDUCATOR**

*6.1.1 May 2003: An Exemplary Chemistry Class*

First period chemistry class: Students enter the class, take their seats: I am not present, so they sit quietly talking to one another. There are no loud voices, no misbehaviors, or moving about the room: they are a model class. I walk in a full eight minutes after the class has started as I was meeting with my coordinator. I greet the class briefly, but then move quickly to the boards and begin writing down the formulas for polyatomic ions and the oxidation numbers of several atoms. I tell them that this day will begin with a short quiz on chemical formulas containing polyatomic ions. I ask the first question: “Please write the formula and name for Magnesium combined with the Carbonate Ion.” Students take out notepaper and get set to answer the question. They are trying to figure out what to write but most are a bit bewildered... many questions ensue. As is my practice, I move through the class helping them to decipher the first questions. Given the level of confusion, I decide to re-teach what polyatomic ions are as many students are having such a difficult time with the concept. Once finished with the brief review, I assign three more problems and give them an opportunity to “finish” the quiz. The tenor of this class is a stark contrast to my chemistry classes in my previous learning community. At one point I mention that a hat should be removed, there is a bit of talk between two students, someone enters late, one head is down on the desk too long, however each incident is dealt with smoothly; compliance is immediate and uncontested. As I watch the video, the authority that I exude strikes me. I am dressed casually, but I am wearing a full-length lab coat. I took to wearing the coat earlier in the year as a matter of practicality because I worked in the labs so often, that it became part of my daily uniform. I had not noticed how “official” the coat makes me look in front of these students: neither

had I noticed how much authority had become vested in my position: I am frightened by this turn of events.

### *6.1.2 A Change in Tone*

Once the quiz ends, I begin the day's lesson: we will explore and explain the periodic trends of atomic radius. The class settles in for the work. I begin to explain the relationship between increasing nuclear charge and the corresponding decrease in atomic radius. As I am speaking, I can see them begin to lose contact with me, as they attempt to make sense of what I am saying. I present an analogy using magnets and metals, to explore the concept of increasing nuclear charge and the corresponding increase in attraction for valence electrons. The metaphor seems to work, until I replace the magnets and pieces of metal with the concepts of a positive nucleus and negative electron cloud. Although they "know" that opposites attract, most are not able to use the concepts to explain the change in atomic radius.

I decide to move on to the graphing activity, hoping that graphing the data will show them visually what I cannot explain verbally. Students are given graph paper, graphing calculators and atomic radius data for the elements in the first four periods (through calcium). More questions erupt as we attempt to graph the data. I suggest to them that the previous night's homework was to read about atomic radius, and prepare for today's class work. Only a handful of students attempted the reading. Students tell me the reading was too difficult. I get the book and read the first two paragraphs: To my mind, the reading is extremely straightforward. The class insists they do not "get it." I go over the text line by line, stopping at each sentence to check for "understanding." They remain stymied: At this point, I confront them; suggesting that the text is NOT difficult, but perhaps it is their reading method. I go to my desk and retrieve an article I am preparing for a presentation: I hold the mass of papers up high and say (loudly) to the class: Look! I have read this several times; I have taken notes on it, and reread it and I still don't "get it." Just because it seems difficult, is no reason to stop. You guys...

As I listen to the man in the white coat, holding the papers aloft, I can sense the divide between him and the class growing. It is not the same type of division that occasioned such acrimony in my early years in the school because I now have an enormous amount of social capital. What occurs as I speak is a very subtle capitulation to my demands, an acceptance of my perspectives on the situation and a sense that the difficulty must lay in their deficiency. There are no loud protests as in the December 5<sup>th</sup> argument with Ivory when students defended their actions and forced me to reconsider my position. Although my “talk” is well intentioned, I am not creating a space wherein students can voice their perspectives, or explain why they found the reading difficult: mine’s is the only voice heard as I now hold all of the power in the room. As I watch myself, I am reminded of b. hook’s (2004) challenge:

*Within complex and ever shifting realms of power relations,  
do we position ourselves on the side of colonizing mentality?  
Or do we continue to stand in political resistance with the oppressed, ready  
to offer our ways of seeing and theorizing? (p. 153.)*

### 6.1.3 A Confession

I decided to become an urban science educator in order to create learning environments that would prove transformative in the lives of children from traditionally marginalized populations. During my first years in graduate school, I was introduced to critical perspective on teaching | learning of science that suggested that in order to provide truly transformative educational opportunity, science educators would need to address the historical injustices and inequities existing in society (Kincheloe, 1998). Critical science educators wishing to maximize the learning potential of minority youth would have to

explore the world, science [and science education] included, for the purpose of exposing this injustice, developing practical ways to change it and identifying sites and strategies by which transformation [could] be accomplished (p. 1191).

Educational systems (schools, their institutional policies and their instructional staff) were implicated in processes that reproduced social inequality (Macleod, 1987) as they

were informed by the same dominant cultural themes (Bourdieu, 1974) and economic imperatives, that had historically oppressed and marginalized members of minority cultures (Bowles & Gintis, 1976). This critical literature resonated strongly with me given my experiences in the civil rights and anti-war movements of the late 1960s. Thus, from my earliest years as a science educator (Carambo, 1998), my praxis was informed by a critical pedagogy (Barton, 2001) that sought to address the many ways in which sociopolitical inequities and hegemonic discourses permeate the classroom field (Seiler, 2001). I felt comfortable in my role as critical educator as I assumed that my cultural perspectives and life history would always position me as an advocate of those with little sociocultural capital. In the ensuing years, my respectful interactions with my students my willingness to include them as co participants in the creation of our learning environment (Carambo, 2005), and my reputation as a caring, approachable teacher, (Roth, Tobin, Elmesky, Carambo, McKnight, & Beers, 2002), affirmed my commitment to a critical pedagogy.

In viewing myself on this day, I see that I am neither respecting nor listening to my students; rather I am using my “authority” to coerce them into accepting my view of their difficulties. Though my talk is well intentioned, it is an oppressive, one-sided diatribe that is making them feel increasingly uncomfortable. Watching the video closely, I see many lower their heads and avert their gaze: others slump down in their seats or fidget with their notebooks. I however, am too involved with my view of events to notice the increasing negative emotional energy and deterioration of the solidarity in the room: the teacher in this classroom is not the critical educator I had assumed myself to be.

I had not until this day seen how I could actively disprivilege my students. There have been times when I had made errors in judgment that occasioned disagreements but I always considered those to be discrete events, not the result of a customary teaching style. As I analyze my interactions with my students, I see that my sense of personal power and social capital in the school are fueling an interactional style that is clearly marginalizing some students who are not responding positively to me. In viewing other tapes of my chemistry classes, I see a similar interactional style that cannot, (given the sociocultural variation in my classroom), be appropriate for all of my students. In each of

the classes there is an air of civility, respect and focus on learning that reassures me, however, there is a very clear sense that I am the person in charge.

I had read the work of fellow researchers in the DUS who had suggested that my teaching style while affording the agency of some students inadvertently shut down or marginalized others (Tobin, 2006). Although I had read the comments before, it is only now that I grasped the full import of their commentary.

It is interesting that Carambo's teaching was adaptive to the culture of students like Ivory but did not afford the agency of students like May who relished one-on-one interactions and was highly successful in learning science in such conditions: (Scantlebury, 2005, p. 203)

Scantlebury's observations are insightful as May was one of the students who participated in our Labs at Penn project and collaborated with researchers in the DUS on various research projects (Elmesky, 2001). Video analysis of her work in these alternative fields shows her to be an energetic, lively, and engaged student who is extremely intelligent and sociable. This was not the case in our chemistry class where she was often withdrawn and rarely interacted with me. Although she passed the class, neither her participation nor academic performance was reflective of the May we see in other learning environments. Matthew was in many ways similar to May in that his academic underachievement in our chemistry class stood in stark contrast to the exemplary fluency he displayed in his motor project. While I cannot say that my style of interaction occasioned his lackluster academic performance in our class, (Matthew already had a long history of low academic achievement and poor attendance), it is clear that I did not provide him an opportunity to alter that history while a student in my class. His exemplary work on his project would serve as proof of his potential when the proper structural resources were provided.

As part of my efforts to fully understand how my teaching style may have marginalized students like May (and Matthew), I interviewed Dr. Rowhea Elmesky who was a fellow researcher. Dr. Elmesky had worked as co teacher and researcher in many of my science classes thus she could provide valuable insights on my teaching style. She had also engaged May and other students in my class in her own research (Elmesky, 2001) and

(Elmesky 2005). Her research included extensive interviews with our student about their families and their lives outside of school. Her knowledge of their life narratives could provide a perspective on their personal lives that I lacked. Given her close relationship with both of us, I was particularly interested in her analysis of my interactions with May.

## 6.2 INTERVIEW WITH ROWHEA ELMESKY

Carambo:

It seems that I made some assumptions about how to teach the students in my chemistry class that may have been as Ken (Dr. Tobin) often says a “one size fits all approach.” I’ve reviewed some tapes from my chemistry classes and I realize that perhaps some students did not respond positively to my teaching style. I’m especially curious about May, as she is a student that is often on tape, but does not seem very responsive to me. You worked extensively with her, thus I’d like to know your perspectives on her as it seems that I may have been mistaken in how I chose to interact with her and others like her. I know that some were successful in our class, but that may not be the case for other students. You were in our classes often so I’d like to ask what are your recollections of the class and how the learning environment afforded or truncated student agency.

Elmesky:

I would answer that question by remembering a few key students and remembering how they were enacting in the class to describe their learning and what kind of learning environment it was. So I think of Marissa I recall her a lot because she was very interactive in your classroom and from what I remember people saying about her ... the semester before [the spring of 2000] she had not always been that way...she would cause a lot of disturbances in the class and would often have to leave, but when I got there I remember the excitement and enthusiasm in her participation. So the way you taught... you invited responses from the students and asked them questions so that they could respond and I remember her so excited... and her booming voice, not yelling out the answers, but really going all out; and I remember one particular day when she gave a good

answer I remember her saying out loud, “I be banging Carambo...I be banging.” and she was just really excited and happy with herself And then I think of someone like Ivory who was similar to Marissa not completely similar but she had similar feature in her manner of being outspoken, calling out in class and being able to be interactive and participatory and when I think of them in opposition to... or on one side of the spectrum... then I think of someone like May on another a different end, someone who is a quieter personality, and when I think of May in the class I remember how she was with me at the university, very quiet, shy and... reluctant in some ways to share her answers in a large group but on the other hand very interactive and engaged in one on one conversations.

Elmesky’s recollection is similar to my memory of May in other small group settings. She was one of the students in our small laboratory class (the Labs at Penn). The video footage of her in those classes shows a markedly different mode of social interactions. Clearly large, intensely vocal group settings constrained her agency as student. This was clearly a reason she was not very active in my class, as I had developed a style of teaching that was very energetic and active; which was more suitable to students like Marissa and Ivory. She usually sat close to Ivory who (like Marissa) was always very vocal and involved in the classroom activities. As their teacher, my understanding of their cultural perspectives was limited by our classroom interactions. Given Elmesky’s knowledge of May’s life history, I wondered if she could help me understand the difference between students like May and Marissa.

Carambo:

How would you characterize the difference between students like Marissa and May?

Elmesky:

So what I think your class provided students and inviting environment for students who typically... I would say the crowd in City would do well with the opportunity to talk and have overlapping speech with you and follow each other’s answers to be able to contribute to the class in that way. I don’t think May was

representative of the style of students and action patterns I saw in City High. When I look at the kinds of artifacts she produced in the DUS projects, she always had an emphasis on the rules her parents had for her and there was an expectation of a particular set of conduct or etiquette that they ingrained in her that encouraged her to behave in that manner and expectations of how she would behave in school.

Elmesky's understanding of May's home culture reinforces the need to fully understand our student's socialization and resulting cultural perspectives. Knowing that her family had instilled norms of conduct that occasioned her quiet demeanor would have made it clear that my style of teaching was not attuned to her way of being. In retrospect I realize that I should have taken time to learn more about her, and in so doing adjust my style of interaction to suit her learning needs. This is not always possible in comprehensive high schools because teachers often have so many students that they cannot find the time to learn all that they need to know about their students. Although I thought I was effectively teaching May, clearly I was not. How I wondered could a teacher meet the needs of diverse students in his classroom?

Carambo

How would an educator who has the best interest of his students handle a situation with two so differing students like May and Ivory? What would you suggest?

Elmesky

I would answer that question by telling you what she told me... After the move upstairs, when her friends stayed in SET, and she was the only one to go upstairs with you and Clare... she told me that she would stop by your class and get tutoring from you... she was struggling a little bit in her physics class and so she would talk about how that really helped her... having those one on one tutoring sessions with her and that is what I would do when I visited your class. I would sit next to her desk and just be there, I was trying to broker the information you were providing on the board and check what understanding she had and helped further explain anything she was confused on ... basically what others were doing in a

loud voice with her quietly. It's really important for the kids who need to do it out loud and interactively to be able to do that with the class and maybe there needs to be some spaces where the kids that aren't so assertive and outgoing and not as confident talking science, to be able to talk and not have to worry about being right in front of everybody... you know to have a space or a time when they can be interacting with you the teacher or with each other so they can talk through the lecture contents.

### *6.2.1 Discomforting Realizations*

Elmesky's insights are troubling as she verifies that I did not provide May (and others like her) the opportunity to maximize their learning potential. As other researchers had noticed, my interactional style while "successful" for many was not appropriate for students who needed a more nuanced style of interaction. While it is fortunate that the presence of other teachers provided these students the support they needed, it remains discomforting to realize that my whole class instruction marginalized many students. As I contemplate how I could have overlooked the needs of students like May, I realize that the successful transformation of the SET learning community and my increasing social capital throughout the school fueled my sense of personal power and the belief that my practices were indeed successful. As a result, I began to focus on the coherences within my teaching field and failed to properly note or address the contradictions that remained. My focus on the successes in my classroom practices obscured these contradictions and as a result, I failed to see that many students were marginalized by my style of interaction. This was a gross oversight on my part for as noted by Sewell (1999) all coherences within cultural fields exist with associated contradictions, and it is through our resolution of these contradictions that praxis truly evolves (Sewell, 2005).

It is (somewhat) heartening to know that while the nature of classroom interactions did not afford the agency of some students, I (with the assistance of collaborating researchers and coteachers) was able to use the array of resources in our learning community to structure learning environments that maximized their learning potential. The exemplary science learning documented in these alternative fields (the Labs at Penn, the May Projects, (Carambo, 2005), the DUS movie project (Elmesky, 2005), indicates that the

structure of these learning environments enabled students and allowed them to fully deploy their stores of capital to transform the science content in ways that proved personally meaningful and transformative. Elmesky's recollection of May and Pierre's return to the Labs at Penn affirms this:

Elmesky:

The third summer after I was in your class, that would be 2-3 years after May left the school, I was doing a research project with some of your students documenting the university resources that would be helpful to students in schools like City high. May and Pierre wanted to go back to the labs where they had studied with your co teacher. It was amazing to see them both go back to their same drawers and pull out all of the equipment, describing what they had done there and explaining to the other students who hadn't been part of the original group, what all the different equipment was for, what they could do with it: and you know... they were so happy...they were all very excited about being there again and remembering all that they had done and learned there.

### **6.3 EMOTIONAL ENERGY IN TRANSFORMATIVE LEARNING ENVIRONMENTS**

#### *6.3.1 Structures within Transformative Learning Environments*

The curricular focus of the Labs at Penn and the May projects was developed through cogenerative dialogues with students to determine their interests. Interests were used to structure the learning environment as a means to increase student engagement and active participation in their learning (Carambo, 2005). Interviews with students indicated that the use of their ideas did in fact increase their engagement and motivation to learn. It is however important to note that interest does not (by itself), guarantee agentic behavior or that students will adopt the culture of the school science community (Olitsky, 2004).

Close analysis of student activity in the Labs at Penn and May projects suggest that it was the nature of social interactions and the positive emotional climate that occasioned the exemplary science learning. Watching the video of these environments, one notices many instances of humor as students learn. Pierre the “gangsta” chemist who shows us how to make “deadly soap” with the many secret materials in the lab, the many jokes between

Jarvis and his classmates as they expertly dissected the frog heart and the many lighthearted jokes between students and teachers evidence the positive emotional tone in the classroom. The positive emotional energy facilitated many successful interactions between students and teachers: (the interaction between Jarvis and me as we compared the frog and sheep hearts) that allowed students to build successful science identities (Elmesky & Seiler, 2007) and experience solidarity with the school science community (Olitsky, 2007). It is the positive emotional energy and resulting solidarity with the culture of the school science community that (in my estimation) accounts for the transformative learning occurring within these alternate learning environments.

### *6.3.2 Interactional Style and Emotional Energy*

Students were unsuccessful in the classroom-learning environment because my teaching style did not afford them the modes of interaction that would have engendered positive emotional energy and feelings of membership in our school science community. As a result, many experienced negative emotional energy, which promoted listless, perfunctory activity and an unwillingness to fully engage in cooperative social activity (Collins, 2004) of our science classroom. Such disengagement with the culture of school is evidenced by inattention in class, incomplete (or missing) assignments, excessive absences, and (subsequently) low or failing grades.

Mathew's lack of solidarity with the culture of our science classroom was evidenced by his many absences; failure to complete required assignments and low tests scores. As a result, he had failed the first grading period of the year and nearly failed the second grading period. His work on his motor project was a stark reversal of his traditional lack of engagement and interest in learning. He would be present each day from the 28<sup>th</sup> of May through the end of school. He would work diligently each day in class and on three occasions stay after school to work on his projects. He attended two additional classes with the auto mechanics teacher, and one with our engineering instructor. As a result of his many efforts earned an A' for his project. A fortunate consequence of his motor project was a passing grade for the second grading period and a desire to successfully finish high school.

An analysis of the video-documentation of his project provides evidence of a chain of successful interactions and a growing solidarity with the school science community. The interactions with his mentor teachers are radically different from my style of whole class instruction and suggest that Matthew (like May) needed a less energetic and supportive interactional style of teaching. His interactions with his mentor teacher allowed him more time to consider new information, discover a connection to his own thoughts and interests, and then (more importantly) ask questions in a safe, supportive environment. It is the emergence of this interstitial learning environment co-constructed by Matthew and his teacher that helped him forge successful science identity and experience solidarity with the school science community (Gutierrez, Baqueando-Lopez, & Teed, 1999). As a result, one sees an increase in positive emotional energy (joy, satisfaction, enthusiasm for learning) throughout the eight-day project.

### *6.3.3 Structures of May 2003 Projects*

Although the May projects in 2002 had proven successful, they had transpired over too short a period of time, and did not afford an opportunity to fully understand how a successful identity or solidarity with the school science community had formed. Our work with the sociology of emotions had indicated that solidarity (as an affiliation with a given community of practice) builds with a series of successful interactions that transpire over time (Collins, 2004). Thus given the resources available in our new community we structured the May projects 2003 to last over the course of several weeks rather than a few days as had occurred in the previous year. The intent was to document the process of students as they moved from their initial research question to the final project. Students selected their project question and then worked closely with one of our science staff to complete their project. This year's projects included a distillation of coca cola, dissection, a solar cooker, chemistry of fireworks, and the physics of roller coasters. Given the emphasis on coteaching in our academy, each project was assigned to team of mentor teachers. Matthew's motor project was one such collaboration with Ian Stith our physics teacher, Scott Koehler the mathematics / engineering teacher, Robert Price (the auto mechanics teacher in another learning community) and me as the chemistry teacher.

A video recorder was dedicated to Matthew's project. Ian documented the entire project and served as Matthew's primary teacher. The following vignettes span the scope of his project, which began on May 28, 2003 and finished on June 6, 2003. The tapes document his successful interaction with his teachers and the emergence of his solidarity with the culture of the science community. As noted earlier, successful interactions are characterized by these four structural factors:

- Bodily co presences (an ecological boundary to outsiders)
- Synchrony of bodily rhythms: (verbal and physical gestures)
- A shared emotional mood (positive or negative emotional energy)
- A mutual focus of attention (Collins,1993)

## 6.4 MATTHEW'S MOTOR PROJECT

### 6.4.1 Day Two May 29<sup>th</sup>, 2011

We began the project with a whole class cogenerative dialogue as was customary to engage student voices and create a sense of co-participation in the creation of the curriculum. The first day of the projects was devoted to discussing possible topics and establishing the guidelines for each project. Matthew expressed an interest in learning



Figure 6.1 Matthew explores the physics textbook

how a coil gun works. This second day is a continuation of the whole class dialogue, as it provides Matthew more time to consider his ideas and refine his topic of interest. On this the second day, he is seated at his desk looking through a physics textbook taking preliminary notes for his project.

Although he is interested in a coil gun,

he is not sure exactly where to start. He leafs through the pages of the book looking for information. Ian notices his quandary and suggests that he might begin with a few experiments on magnets.

1:07:13	Ian	Interrupting Matthew	Matthew?
1:08:18			Matthew stops reading, looks up, establishes eye contact with Ian
1:08:12	Ian	Continuing	Along with what you said before, since you want to make a coil gun, you could also do like some kind of smaller experiment for each of the parts, like some experiment that goes along with magnets, some experiment that goes along with electromagnets, and then the coil gun
1:28:06	Matthew	Unsure of what to ask	What kind of experiment could I have with regular magnets?
1:33:10	Ian	Pausing slightly	Well... I mean something real simple, basically
1:37:25	Keisha	Joining in	Just how things stick together
1:39:09	Ian	Continuing	Yeah, just do different things to see what 's magnetic, what's not magnetic, then think about why, just simple activities, think about why things are magnetic, why things are not.
1:53:24	Matthew considers Ian's suggestions for a few moments. He then formulates a plan of study		
2:00:18	Matthew	As he writes down his plan	All right, learn about magnets, how do they attract, shat they're attracted to, how they attract... (Remembering an important fact, he carefully note), Opposites attract.

This opening interchange is important to the ensuing relationship, as Matthew is very tentative and unsure of how to proceed with his project. Ian sensing this carefully interrupts and suggests a few ideas that will help create Matthew's learning space. It is important to note that Ian provides some resources for the exploration, but does not impose his notions on Matthew. Rather, (this will occur throughout the project) he allows



**Fig. 6.12** I" were to say metals stick to metals...

Matthew to contribute to his learning in ways that allow him to deploy his cultural capital as an equal co participant in the learning environment. In this way, the two create the interstitial space in which respect and trust are continually co-constructed. Matthew pauses, and very carefully notes a concept he has remembered

from previous science learning, “Opposites attract.” This will occur at many points during his project as he increasingly contributes his cultural and symbolic capital to his project. The relationship between Ian (a white, middle class, first year teacher) and Matthew (an African American student from an inner city urban neighborhood) illustrates the cultural alignment needed to co create transformative learning environments. Although the two represent two distinctly different cultural narratives, the resources within their learning environment allow each to fully deploy their stores of capital in a space “devoid or assumed or imposed hierarchies” (Bhabha, 1994). This relationship will provide Matthew a space in which he can ask questions, look for answers, and be able to say “I don’t know” without experiencing the symbolic violence that students often feel as they learn difficult science concepts. As the days progress, his increasing knowledge, self-confidence and successful cultural production will engender an increasing positive emotional energy and solidarity with the school science community. It is the combination of these interstitial cultural resources that enable his exemplary science learning.

13:11:07	Matthew	Looking up, making eye contact with Ian	If I was to say that magnets... that magnets stick to metals I should be, I should be specific right? (Pausing). Like
13:19:18	Ian	Overlapping	Which metals... right
	Matthew	Nods in agreement, then quickly returns to his textbook	
13:29:23	Ian	As Matthew reads	Well you didn’t test them yet; you’re not sure, so you’re going to say some. You’re not sure, You’re going to ...
13:32:25	Matthew	Looking up overlapping Ian,	Some metals
13:33:16		Overlapping Matthew	Sure. You’re going to find out



**Figure 6.3** Matthew counts off his project goals

Matthew returns to the textbook and continues to write notes into his project notebook. As the class period ends, Matthew describes the scope of his project. As he speaks, he holds up his fingers to count off the goals of his project.

27:05:27	Matthew	Holding fingers up to count off each of his learning goals	So first I'm going to relate magnets to the Earth, show how magnets repel and attract
27:13:17	Ian	Agreeing	OK
27:15:21		Matthew refers to his project notebook	
27:20:08	Matthew	Reading from his notes	Magnet makes a new north and south pole...

#### 6.4.1.1 Analysis of Classroom Interaction

Through this day's interaction, Matthew was able to elaborate his project in his own time. Although he was initially unsure and tentative in his thinking, Ian's suggestions helped him use his cultural capital to develop his own questions and establish his own learning goals. The time spent is well over thirty minutes and attests to the patience Ian displays in listening, encouraging, and supporting Matthew. It is this extended period with a supportive teacher that provides the foundation for the learning environment within which Matthew will develop his identity as a successful science student.

#### 6.4.2 Day Three: May 30, 2003

Ian and Matthew converse at one of the classroom laboratory tables. Ian is sitting cross-legged on the table: Matthew sits on a lab bench. The conversation is very relaxed as they discuss what electrons have to do with magnetism. Matthew posed the question as part of his research, but he has been unable to find a reasonable answer. Ian begins with a question:

0:04:16	Ian	Opening the discussion	What have you learned in chemistry that has positive and negative charges
00:8:17	Matthew	Pauses briefly then, remembering	Oh in atoms...
00:10:04	Ian	Continuing	...And in an atom what's negative
00:12:23	Matthew	Thinks a moment looking at Ian, then remembers	Oh, the electrons
00:16:24	Ian	As he speaks he makes a wide gesture with his hands	So those two ideas are merging here.
00:18:19	Matthew follows the gesture with his eyes, nodding as Ian speaks		
00:20:20	Ian	Continuing to gesture with his hands	You've got the electrons (pauses)
00:23:26	Matthew looking briefly away		
00:24:01	Ian	Continuing	And in your magnet you have north and south poles

00:29:10	Matthew	Still looking away	
00:32:08	Ian	Looking directly at Matthew	So somehow they're connected.
00:32:20	Matthew reestablishes eye contact		
00:34:20	Ian	Maintaining eye contact	Now I'll tell you this part in metals, (Pauses to consider a thought)
00:49:1	Ian	Continuing	You know how in chemistry you talk about things bonding together
00:52:02	Matthew	Matthew nodding looks away briefly	Yeah
00:53:16	Ian	Continuing.	Covalent and ionic bonds. That's how stuff is formed... you know about molecules, atoms, bonding together right?
1:03:08	Matthew re establishing eye contact, nodding yes, as he maintains eye contact		
1:06: 14	Ian	Gesturing the flow of electrons with hands	In the case of metals, the electrons flow easily literally from one end of the metal to the other.
1:10:02	Matthew is looking directly at Ian as he illustrates the electron flow: He watches the gestures, nodding that he understands the explanation		
1:19:21	Ian	Continuing	So like (Pauses briefly)...like if you have a charged object and you touch it on uhm...(Ian looks for a suitable material)
1:21:20	Matthew looks away briefly, then remembers an important idea, returns his attention to Ian		
1:24:19	Matthew	Interrupting, overlapping Ian	Oh yeah, if you...
1:25:09	Ian	Overlapping Matthew; Pointing to the metallic base on the lab table	So if you touch it here, right?
1:26:21	Ian and Matthew place their hands on the metallic base. Matthew will maintain contact with the metallic base and eye contact with Ian for the next several minutes		



Figure 6.4 "So if you touch it here."

Using the metallic base on the laboratory table as a resource Ian illustrates how the movement of electrons can temporarily polarize substances. As Ian speaks, Matthew also places his hands on the metallic base, nodding in agreement during Ian's explanation. They will both use the base as a mutual focus of attention.

During the ensuing discussion, Ian continues to use the metallic base to demonstrate the polarizing of metallic objects.

1:28:29	Ian	Focusing the attention on the metallic base	Then whatever side it is, that you're touching
1:30:02	Matthew keeps both hands on the base, while maintaining eye contact with Ian		
1:32:29	Ian	Tapping the base with his hands	Let's say it's the positive side, ...
1:34:16	Matthew signals he understands as he focuses his gaze on the metallic base		
1:35:09	Ian	Questioning Matthew directly	It's going to attract, what?
1:37:13	Matthew	Not sure of the correct answer	It's going to attract the ... it's going to attract the... not the electrons...
1:43:04	Ian	In a soft voice	Yeah the electrons
1:44:11	Matthew	Looking at Ian directly. Surprised at the answer.	It's going to attract the electrons?
1:45:18	Ian	Correcting Matthew	Yes the electrons... the electrons have a negative charge.
1:46:01	Matthew	Overlapping Ian's response	I do know that if you took a piece of metal that wasn't magnetic
	Matthew	Illustrating the movement with his hands	And you rub a magnet up against it like this way, it'll take the electrons and line them up so then therefore that metal will become magnetized
2:02:12	Ian	Interrupting	Temporarily
2:03:14	Matthew	Nodding in agreement	Yeah temporarily



**Fig. 6.5 Matthew illustrating how to magnetize a piece of metal**

The notion that electrons are “lined up” by an external magnetic field is an oversimplification of magnetic phenomena however, it is important to the success of this interaction that Matthew feels comfortable enough to contribute his cultural capital to the discussion. Although his notions are not correct, they will gain in sophistication as he learns more about ferromagnetic materials, magnetic domains and electron spin. Ian does not correct Matthew's ideas in a manner that might discourage or shut him down, rather

he continues the discussion of how electron flow creates temporary polarity in metals as it is a good opportunity to illustrate how the movement of electrons affects everyday phenomena such as static electricity and lightning. Ian will suggest that electron movement has much to do with magnetic effects but he will leave that question for Matthew to discover on his own.

#### 6.4.2.1 Analysis of Interaction at the Lab Station

This day's discussion is an example a successful interaction between Ian and Matthew, as it fulfills all four of (Collins, 2004) parameters of a successful interaction. The lab station established an ecology boundary to the rest of the class so that the two are within their own social field. Within this short vignette, one finds multiple examples of synchrony of verbal and physical gestures as the pair discuss electrons and their effect on the macroscopic properties of matter. Matthew and Ian make and hold eye contact for several moments at least 8 times during their discussion. Eye contact indicates close attention to what each is communicating. The coordination of their hands as they touch the metallic base on the lab table offers further proof of synchrony as do the many instances in which the pair nod their heads in unison or follow each others gestures with their gaze. Although the emotional mood is (as on the first day) subdued (there are a few moments of laughter, but no obvious displays of joy or happiness), the emotional energy is distinctly positive and congenial as evidenced by the close physical contact and relatively relaxed physical positioning of the two during their conversation. The metallic base on the laboratory station provides a physical mutual focus of attention, however it seems that the microscopic view of electrons and their activity is the real focus of their attention.

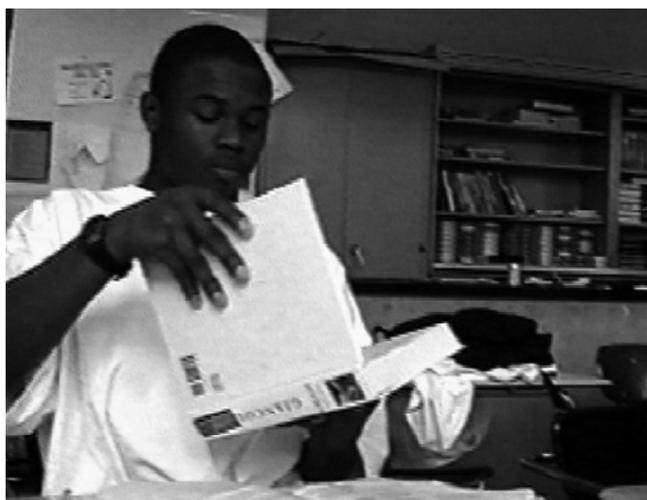
The day's work is important from a sociocultural perspective, as Ian has allowed Matthew to contribute his stores of capital to the discussion without making him feel incompetent or unintelligent. Ian handled the several mistakes that were made in a manner that allowed him to teach canonical concepts without making Matthew feel foolish for volunteering an incorrect answer. In this way, he avoided symbolically violent actions and (more importantly) allowed Matthew to continue building solidarity with the school science community. It is evident from Matthew's plans for his project that he is

continuing to build a science identity and that his sense of solidarity with the school science community is growing. This will be most evident in the ensuing days when he makes the first of three trips to the auto mechanics shop to learn from Mr. Price. The trips will add considerably to his social capital and sense of accomplishment. It is also instructive to note that Matthew (like May) is enabled by a one-on-one style of interaction that provides a quieter, slower space within which to learn. It is this type of environment that Elmesky suggested was more appropriate to students who needed a less energetic style of interaction. Watching Ian's successful interaction with Matthew suggests that perhaps he too would have benefitted from this type of interactional style.

#### 6.4.3 Day Four: June 2, 2003

Matthew has returned to his study of the physics textbook. He will attempt to understand the relationship between the movement of electrons and magnetism. This question emerged from the previous discussion with Ian on electrons and their relationship to magnetic fields. Although he understands that electrons have something to do with magnetic domains, he has yet to find a viable explanation. As he leafs through the pages, he becomes slightly frustrated, as he cannot find the necessary information. He comments to Ian.

04:09:16	Matthew	Slightly frustrated, looking directly at Ian	All right, you explained it to me but this book doesn't say anything about the different types of metals or electrons...
	Matthew continues leafing through the book. A heavy sigh communicates his growing negative emotional energy		
04:14:25	Matthew	Shaking his head as he turns the pages	Metals....
04:17:14	Ian	Watches Matthew then says with a slight laugh	Well then you need a new book
04:20:21	Matthew smiling, surprised looks at Ian		
04:23:27		Pointing to the bookshelf behind Matthew	It might be a little difficult, but you see there on the second shelf... it 's called Giancoli's physics
04:28:25	Matthew retrieves the text returns to his desk		



**Figure 6.6 Reading the Giancoli physics textbook**

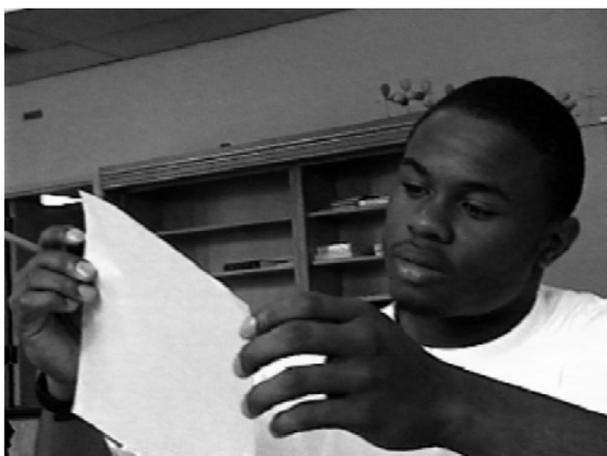
Matthew retrieves the textbook, returns to his desk, and opens to the index to find his topic: magnetism. He then turns to the corresponding chapter in the book and begins to read. After a few minutes he stops and asks:

Matthew: Is this a college text?

Ian explains that is a college level text with many more equations and more complex information than our physics text. Matthew smiles and returns to his reading. Although the text is very rigorous, he seems to enjoy the challenge it presents. As he reads, Ian suggests that a second chemistry text might provide additional information. This too is an advanced high school text, Brown and Lemay's Chemistry. The books are in Mr. Koehler's (the engineering teacher) classroom. Matthew leaves our class to retrieve the additional resources. He returns after a time with several new texts, and a periodic table. He has spent some time with Mr. Koehler: the two discussed the relationship between electron spin, magnetic domains, and magnetism. Once settled in his seat, he begins to relate what he has learned to Ian.

2:36:19	Matthew	Sitting back in his seat as he speaks  Leaning forward closer to Ian; gesturing with his two fingers to show the "size" of domains	In the metals like iron it has... inside of iron (pause momentarily)  ...Iron's magnetized by itself because there's these little particles called domains that has little north and south poles (pauses briefly)
2:42:14	Ian	Listening attentively	OK
2:47:19	Matthew	Gesturing "straight lines with his hands"	That is all lined up....
2:49:13	Ian	Repeating Matthew	They're all lined up
2:50:08	Matthew	Overlapping Ian	Yeah and the same thing for certain metals...
2:54:11	Matthew	Looking at the large periodic table hanging on the wall	Now on the periodic table

2:55:02		Realizing he has a smaller one;	I have one; (reaching for a table he received from Mr. Koehler
2:58:28		Looking at the periodic table for several seconds: looking for the metals and non metals	There's a part that has non metals and metals
3:09:16			Mr. Koehler said I should look on the table.
3:14:11		Shows Ian the textbooks Mr. Koehler gave him...	He showed me these other books.



**Fig. 6.7 Matthew analyzes the periodic table**

3:16:09		Matthew continues to study the periodic table for several more seconds. He is attempting to understand something about metals, but he is not succeeding. Ian interrupts	
3:26:10	Ian	Breaking Matthew's silence and circling around to look at the table. He is standing over Matthew's shoulder.	Well looking at the periodic table
3:30:15	Matthew	As he speaks, he begins to shake his head slightly as he is unsure of the concepts he is describing.	He said magnetism had something to do with electrons and atoms, and charge and atoms are magnetized, and on each orbital (pauses to remember an idea) the electron has a north and south pole to it and metal, (shaking his head) and atoms in a metal. Transferring electrons back and forth

During this latter segment, Matthew's frustration is increasing as he has difficulty with the concept of electrons and how they affect magnetism. His recollection of the discussion with Mr. Koehler is faulty, as he does not seem to be able to remember all of the pertinent concepts. He continues to look at the periodic table in an attempt to recall the relevant information, but his inability to remember is causing him to become frustrated. Ian notices the growing negative energy and circles around closer to him and

refocuses the conversation on the periodic table. This resource will serve as a mutual focus of their attention, and allow Matthew to continue successfully building his knowledge. This is a pivotal day for him as he has taken a great risk in reading the Giancoli and the Brown and Lemay textbooks, which are both advanced college texts. Although electrons are covered in the standard curriculum, the more detailed concepts of electron spin and their relation to magnetic fields is not part of the eleventh grade science curriculum, thus the concepts are very new to him. Ian is aware of this and makes every effort to continue the discussion in a way that lets Matthew construct the knowledge on his own.

3:55:15	Ian	Circling around to Matthew's left then taking hold of one side of the periodic table he asks	I know what you're saying is sounding good  Where are the metals on here?
4:00:09	Matthew	Matthew leans into Ian to show him. He too is holding the periodic table. They are in very close contact as they look at the table together.	Those are non metals and these are metals here...and some of these are metals too, like iron, cobalt
4:09:22	Ian	As he continues to hold the table	Gold yeah
4:12:07	Matthew	Matthew releases the table, looking away from Ian. He is considering a thought	But gold isn't ahh (pauses briefly) ... affected by a magnet
4:16:19	Ian	Questioning	It's not?
4:18:26	Matthew	Overlapping each other	It's certain metals
4:18:26	Ian	Overlapping each other	...That's a good question: Why some metals and why not others?
4:22:29	Matthew	Attempting to explain, but he is not sure of the answer	Certain metals have little pieces... I think (pauses briefly), iron I think

Ian and Matthew hold the periodic table together. Matthew occasionally glances at the larger table on the wall, but his primary focus is on Ian and the table they are holding. Their speaking turns follow closely upon each other: at times, they will speak simultaneously. Focusing the discussion on the properties of metals and non-metals is an effective way to incorporate Matthew's capital as he has already completed an exploration of which metals exhibit magnetic properties and which do not.

4:26:22	Ian	Still looking at the table	What about copper? Did it attract?
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4:27:11	Matthew is looking at the larger periodic table. Nods yes to Ian's question.		
4:28:09	Ian	Questioning tone	It did?
4:29:03	Matthew	Surprised look on his face  Correcting himself; shaking his head no as he speaks	Oh it did?  I'm not sure.  No, no it doesn't.
4:32:13	Ian	Referring back to the table	So what is true about copper and gold on here?
4:36:12	Matthew	Looking ahead, then turning to make eye contact with Ian as he is not sure of his response	They aren't, they aren't, well copper is just one solid thing by itself, and it's not mixed with any other metal...
4:42:23	Ian	Referring to the periodic table	Well, neither is gold
4:43:24	Matthew	Repeating Ian's words as Ian completes his sentence.	Yeah, neither is gold (pauses). Right.

The last interchange is telling as Matthew has made several errors in his thinking: first thinking that copper was attracted to a magnet, then that copper was an alloy. It is important to note that his errors do not interrupt the flow of the discussion or introduce any negative emotional energy into the environment. Rather his perseverance (in light of the difficult concepts he is attempting to comprehend) is evidence of an internal, highly personal motivation to fully understand the concepts of magnetism. Such a subjective commitment to the learning of science is indicative of his emerging identity as a science student and his growing solidarity with the work of the school science community.

The interchange is also evidence of the trust that Matthew has in Ian. It is this trust that allows him to make mistakes, correct himself and continue to contribute his cultural capital to their discussion. In other circumstances, students like Matthew, might feel disadvantaged and disengage from their learning, however this social space allows him to take risks without feeling that he will look foolish or unintelligent. Ian's careful method of correcting Matthew's mistakes reaffirms the respect he has for him and encourages Matthew to continue exploring and learning. Ian refocuses their attention on the periodic table as the discussion continues.

4:46:15	Ian	Pointing again to the table: Refocusing the discussion	But look on here
4:47:06	Matthew	Matthew leans in to the periodic table.	
4:47:22	Ian	Pointing to the table	Where's copper and where's gold?



**Figure 6.8 Matthew leans in to point on the periodic table**

4:49:02	Matthew	Pointing to the table. Peering closely at the table	There's Copper ...and gold is... I forget...Let me see.
4:52:00	Matthew	Not finding the symbol on the smaller periodic table, turns to look at the larger table on the wall,	
4:53:14	Ian	Ian points to the table they are sharing Matthew returns his gaze to the smaller table	Copper's here.
4:53:17	Matthew	Focusing on the table again	Right
4:55:12	Ian	Questioning Matthew	Isn't it?
4:55:28	Matthew	Both looking intently at the table	Yeah and gold is
4:56:07	Ian	Simultaneously speaking	Gold's down here
4:56:22	Matthew	Simultaneously speaking	Down here
4:57:11	Ian	Suggesting a pattern	They're in the same line
4:58:22	Matthew		Ain't it got something to with the ahhh... (Pauses to consider Ian's observation)
5:01:07		Noticing Ian's suggested pattern	So is silver
5:02:27		Agreeing then questioning	Yeah so is silver...did you test silver?
5:05:12	Matthew	Looking directly at Ian  Then shaking his head as he	Silver isn't magnetized by a magnet:  I didn't test it, but I know it isn't.

5:09:00		speaks.	
5:11:21	Ian	Pointing at the group of metals	Ok, So, what's true about all these then?
5:13:24	Matthew pauses as he looks at table keenly, then in a surprised tone.		
5:15:06	Matthew	Surprised at the pattern	Oh! Because they're all closer to the non metals that's why
5:17:21	Ian	Ian gives a slight congratulatory laugh	You're right.

The discussion has provided Matthew an opportunity to discover a pattern on the periodic table. This provides both the opportunity to continue the discussion.

5:19:13	Ian	Focusing on the pattern on the table	So let's see, what's really, What's really magnetic?
5:26:24		Looking around the table	Let's see. . Where's iron on here
5:27:12	Matthew	Pointing confidently	Iron's right there in the middle. Fe
5:31:06	Ian	Continuing to look at the table.	Right there OK
5:34:12			Did you try any of these others,
5:36:20	Matthew		No, I didn't
5:39:17		Continuing	Because they may be even more magnetic
5:42:06		Looking directly at Ian With confidence	Yeah they're probably magnets.
5:44:16	Ian	Agreeing with Matthew	Probably are magnets
5:46:19		Questioning.	So the closer they are to the non-metals the less magnetic they are?
5:52:11	Matthew nods yes as he focuses on the periodic table		
5:54:24	Ian	Starting then pausing To rephrase his question	OK, So what... What's making them non magnetic
6:00:09		Matthew	Repeating the question to himself as he continues to study the table
6:03:06	Ian	Reinforcing the question	And what 's the difference?
6:04:26	Matthew	Ponders the question for a time while looking at the table.	What's the difference?
6:09:23		He cannot answer the question	Well I guess...

Matthew and Ian attempted to resolve this last question, however the discussion would end as the class ended. Ian's supportive, patient guidance were crucial during the moments when Matthew became confused by the complex concepts of electron spin and

polarity in metals. He was able to redirect Matthew to the concepts he knew and then use his knowledge to fashion and answer questions that were pertinent to his project. This day's interaction provides Matthew a sense of his ability to put together complex concepts. Although many questions remain unanswered, he has been able to figure out that there are "particles" called domains that are aligned in those metals (iron, cobalt, and nickel) that are magnetic, or are attracted to metals. Although domains are not "particles," he will eventually understand that it is the polarity within these domains that give magnets their north and south poles. He has also figured out that the closer the transition metals are to the non-metals the less magnetic they are. He was not however, able to fully conceptualize why metals (such as gold, copper, silver and aluminum) are not magnetic. This question will unfortunately remain unanswered, as Matthew's attention will shift to building an electromagnet and thence a motor. It is most impressive that he remains undaunted in the face of questions he cannot (as of yet) fully answer.

#### 6.4.3.1 Additional Resources: Analysis

This day's interaction is very instructive on a variety of levels. Chiefly one sees Matthew's cultural and social capital growing, as he is more able to comfortably contribute concepts he has learned to his ongoing investigation. He is able to use the various resources in our classroom, and when needed access those in other fields. In the ensuing days, he will travel to Mr. Price's<sup>2</sup> classroom as he will be able to use his more extensive collection of metals, metal cutters and direct voltage sources to build his first electromagnets: it was in Mr. Price's classroom that Matthew first attempted to build a motor. The interaction with Ian again fulfills the parameters of a successful interaction as the participants have a consistent mutual focus on the periodic tables and other textual resources. Although there are many students in the room, they maintain their ecological boundaries and remain in close personal contact throughout their discussion. There are many instances of physical synchrony as they locate elements on the periodic table. The many occasions of direct eye contact provide further evidence of their coordinated physical movements. The emotional energy during the early moments of the interaction

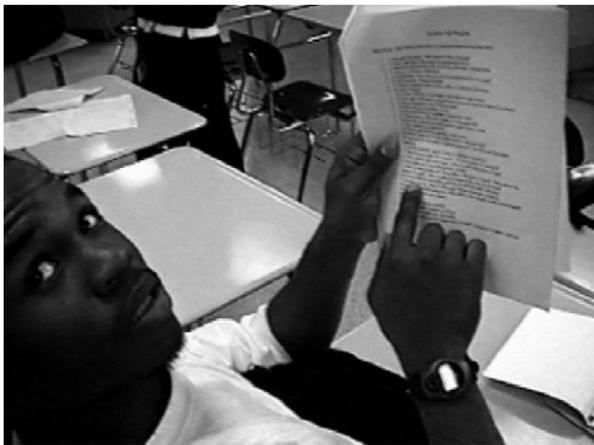
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<sup>2</sup> Mr. Price was a former co teacher in one of our physic's courses. He had an auto shop in another learning community located in the basement of the school.

seemed clearly negative as Matthew struggled with the microscopic properties of magnets. His emotions became more positive as he and Ian focused on the patterns within the periodic table. Although the emotional mood within the environment remains subdued, Matthew's continuing enthusiasm for his project suggests that his emotional energy remains positive.

#### 6.4.4 Day Six June 4, 2003: Increasing Social and Cultural Capital

On these days, Matthew visits Mr. Price's classroom. Mr. Price's auto shop he had access to a wide array of metals, metal cutters, wires, and power supplies. He was able to create his most efficient electromagnets, and attempt to build a motor. On the afternoon of the fourth, he gives Ian a report on his progress.



**Figure 6.9: I know how to do all these things**

Price showed us how to make motors and how to make series and parallel circuits. (Pauses and points to a list of electricity topics he has acquired). I think I can take these and put them together. I know how to take a wire wrap it around a couple of times (circling motion with his hands), and hook it up to a battery and make a magnet, and I know how to

take a wire (making an imaginary coil with his hands) and put a magnet through it (illustrates putting the magnet through the imaginary coil) and make current. I know how to do all of these.

The list is an impressive account of his growing cultural capital. He has learned enough to work independently on his project. He is most eager to build a motor as part of his display for the class. He begins to work on the motor however he is not immediately successful. He will continue to work on his own until the motor is built.

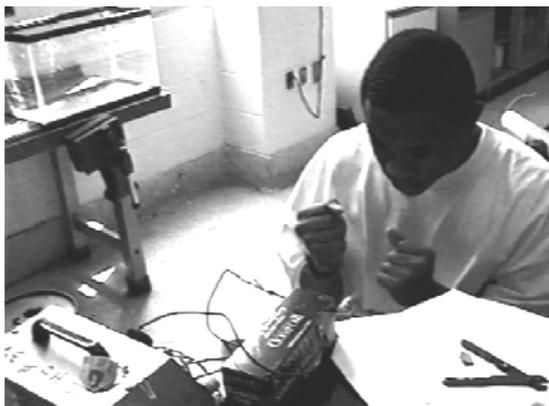
### 6.4.5 Day Seven: June 5, 2003: Successful motor project

This day's activity is narrated at the opening of this dissertation. It is included here for continuity.

*June 5, 2003*

It is late in the afternoon on one of the last days of the school year. The class has emptied as the majority of the students in my chemistry class have completed their end of year projects. Matthew however has remained behind: he is still working on his project to build an electric motor. This is his third try: as his previous models have all failed. He reshapes the coil of wire that serves as his armature as it does not sit correctly on the contact points. He discovers an error in his wiring.

00:27:14 Matthew: "Oh, that's why it ain't working." He adjusts the clips, cleans the contact points, rechecks everything, and turns on the power.



**Figure 6.10 Yes!**

2:14:04 The coil of wire spins: he raises two clenched fists in a gesture of success. A silent, private "Yes" communicates the pride in his accomplishment. His success however, is short lived as the motor stalls. He pauses for a moment, then confidently readjust his connections, rechecks the circuit and voltage settings. He turns on the power and the coil begins to spin freely.

3:17:20. "There it goes," the motor works but the motion is halting. It stops and starts in bursts of motion: the motion is not continuous. Matthew has stayed after his regular class time because he feels he is close to success. Although his previous attempts have not succeeded, this day may prove different. He continues to adjust his setup.

4:11:23 The motor achieves a continuous steady spin. He gives a slight celebratory dance moving his shoulders about.

4:14.25 He looks up (toward and unseen audience) and gestures to his work “See that?” He watches the spinning coil for several seconds, smiles, and remarks to himself:



4:18.25 “That’s decent.” He beams a broad smile of contentment.

**Figure 6.11 See that?**

4:23.23 He looks up at us, smiles and points once again to his accomplishment. His look conveys self-satisfaction and pride in his intelligence.

4:24.07 “That’s decent. Yo! I did it!” He raises the voltage to the circuit.

4:31:02 His voice rises in surprise. “It can go faster!”

4:41:04 The motor continues to spin efficiently: “That’s decent.”

4: 57:34 Sparks begin to fly, wires are overheating: the voltage is too high. He lowers the current, and sets the motor to work again. I am at the far end of the room: Ian the other co teacher is nearby. He calls out to us:

5:06.44 “ Hey I worked it. I finished it.”

Ian and I walk over to his workstation: the motor continues to spin efficiently. We are all extremely happy with his accomplishment, as he has worked diligently to achieve success. This would be the eighth day of his project. We chat briefly about the motor and make plans for his write-up of his project. Surprisingly, Matthew is not through. He wants to return the following day to adjust his motor, and assemble a few examples of his electromagnets to show the class.

This would be an impressive moment in Matthew’s project as he worked alone to perfect his motor. In order to work correctly, each part of the motor needed to be carefully adjusted, thus it took several versions to get each component aligned properly. He began

work on the previous afternoon and worked this entire class period. He remained after the class ended because he certain he would succeed. His success was a testament to his perseverance and confidence in his abilities. This would also be the first day that Matthew openly displayed joy (as evidenced by his broad smile and joyful comments). His emotions during his project were never overtly joyful as much of the work was difficult for him. Thus although we assumed a positive emotional climate, joy has not been evident in his interactions with Ian. His continuing enthusiasm and energy for the learning of science were evidence of his positive emotional state. Mathews broad smile on this day is indicative of his great satisfaction with his accomplishment.

#### *6.4.6 Day Eight: June 6,2003: Building and Showing*

On this day, Matthew prepares to show his accomplishments to his classmates. He has created a workspace at one of our side tables. He has assembled several ammeters and voltmeters, a VARIA (his variable power source), many spools of wire, tools, several electromagnets, and his motor. He will assemble his artifacts and explain each one to anyone who visits his workstation. The VARIAC serves as his power source. It is interesting to note that he is wearing white lab coat as he works. As the class starts, he takes a large coil of wire and connects it to the VARIAC. Sean approaches to see what he is doing. Matthew explains:

12:04:21	Matthew	Pointing to the wire coil as he wiggles his fingers to simulate current going through the wire	When you pass a current through a coil of wire you make a magnet
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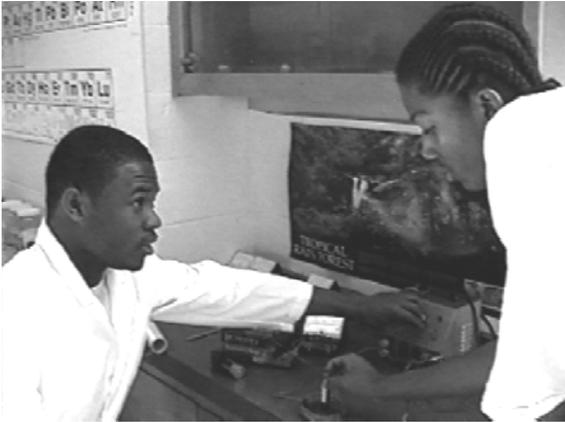
Matthew then retrieves a small metal rod, which he hands to Sean

12:12:09	Matthew	Handing Sean a small metal rod	Come here hold this
12:14:09		Sean hesitates: Matthew encourages him to place the rod in the coil of wire	It's OK; it ain't going to shock you.

As Sean places the coil in the wire, Matthew reaches over to the VARIAC and adjusts the voltage. As he does so, he looks intently at Sean.

12:04:21	Matthew	Looking intently at Sean	Let me know if you feel something
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As Sean lowers the rod in and out of the coil of wire, Matthew adjusts the voltage on the VARIAC.



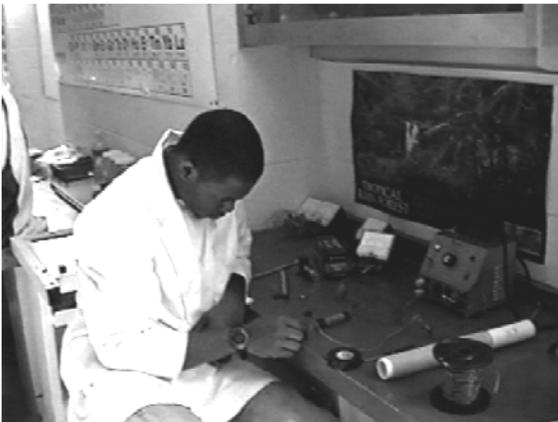
Matthew: Do you feel it?

Sean nods a silent yes.

Matthew then explains that the current in the coil makes a magnet that attracts the metal.

**Figure 6.12 Do you feel it?**

Sean leaves the table and Matthew continues to prepare his artifacts. He connects the wires of one of his electromagnets to the power source. It is a long piece of PVC pipe with many turns of orange wire encircling it. There is however insufficient power to run it: to run it efficiently he needs the power supplies in Mr. Price’s shop.



As the two speak, Matthew connects a smaller electromagnet to the power source. It has a small metal rod as its base He draws a piece of metal to it to test its magnetism. As he does so, Ian asks a clarifying question.

08:57:12 So where’s it magnetic?

**Figure 6.13 Testing an electromagnet**

08:45:12	Ian		Where’s it magnetic? Only at the front? At the two ends?
08:50:22	Matthew	As he touches metal to the two ends	Only at the ends.
09:12:28	Matthew adjusts the power on the VARIAC, tests the magnetic field. It is not strong enough. He resets the VARIAC, readjusts the voltage: the magnet works. He turns and nods to Ian.		
09:13:29		Nodding to Ian	Yeah it works, it’s attracting

	Matthew continues to adjust the power to test the ends of the magnet. As he does so Ian asks		
09:27:20	Ian	As Matthew tests the magnet	And where's the magnetic field coming from?
09:29:19	Matthew	Responding without hesitation. Circling his fingers to simulate the turns of the wire	The magnetic field is coming from the wire
09:32:11	Ian	Probing	But... Why?
09:34:16	Matthew	Circling his hands to simulate the current going through the wire	There's current... current going through the wire
09:38:07		Testing the magnet's ends	I'm not really sure which end is north or south
09:40:23	Ian		Well that's OK. But current is causing the magnetic field?
09: 46:10	Matthew	Nodding in agreement. Circling his hands	Yes. It's going through the coils
09:50:08		And then remembering	The more amount of coils you have, I think, the... the stronger the magnet

Matthew has gained an excellent understanding of the relationship between current flow and magnetic fields. He is aware that the field is strongest at the ends, and that the greater the number of coils, the stronger the field. This canonical knowledge was gained as a



**Figure 6.14** Matthew assembles an electromagnet

result of his own experimentation, reading, and interactions with his teacher. It is now part of his cultural capital. After answering Ian's questions, he pauses for a few moments to consider his next action. He decides to build another electromagnet as the first magnet has a very weak field. To assemble his electromagnet he cuts a length of wire

from a spool, deftly strips the ends, and then selects a small copper rod to serve as the base of the magnet. He tapes an end of the wire to rod then expertly wraps the remaining wire around the rod until the entire dowel is covered by wire. He then connects the wires to the VARIAC to test his magnet. A curious event occurs, as the magnet does not work. All of his magnets have worked efficiently but this one has no magnetic field. Matthew is

puzzled as he has been so successful to this point. His next moves evidence his strong identity as science student and his expert knowledge of his equipment. He disconnects the magnet from the power source and sets an ammeter across the circuit, to check the current. Ian watches patiently as Matthew works. He then poses a question:

13:38:21	Ian	Questioning	So if it wasn't working, what are you gonna do?
13:40:18	Matthew	Speaking as he connects the ammeter to the circuit	I'm gonna see if there's any current going through this wire

Matthew suspects the power source is at fault. He has noted at various times that the power source in our lab is not as dependable as those in Mr. Price's shop. The meter confirms that there is little current going through the circuit. Matthew resets the VARIAC: still no current. He tries again with the same results. He stops to consider his options. Ian proposes a solution.



**Figure 6.15** Considering his options

Ian: Do we have batteries here?

Matthew nods in agreement and sets out to find a battery. He returns with a 6-volt dry cell. Before using the battery, he checks its power with a voltmeter, as many are weak from constant use. The cell is fine, so he sets it into the circuit. He includes the ammeter to check the current flow.

He checks the magnet. It produces a very weak field in the wire, but it is not as efficient as the other attempts. He replaces the magnet with his earlier one, (the one with an iron rod as the base), and it produces a stronger field. He compares the two magnets: one has iron as a base, the other copper. He does not know the answer to this. However, his response is similar to his frustrations with the motor. He will investigate why the copper base magnet works so differently. He has sufficient knowledge and confidence to

continue the exploration on his own, as he does not have time this day. Matthew lays out his various electromagnets for display. Ian picks up the coil of wire, and asks:

18:40:12	Ian	Surveying the various magnets	When they make a real electromagnet, do they use a coil like this one?
18:47:17	Mathew	Stops to think; considers his answer	Yeah, but they usually wrap it around something?
18:50:10	Ian	Still surveying the magnets	So you looked up information? How to make these?
18:53:05	Matthew	Nodding yes then holding up a length of 2" PVC pipe with wire wrapped around its entire length  Then motioning to a magnet on the bench	This is actually one I looked it up how to make this one on the internet
Matthew explains how he constructed the PVC electromagnet. Then continuing			
19:09:07	Matthew	Continuing, referring to the magnets on his bench	But a real electromagnet could be just wire wrapped around a nail. I got one of those over here.
19:18:23	Ian	Questioning once more	So does the metal become magnetized?
19:22:18	Matthew	Reaching to retrieve a long metal rod,	Yeah, I could magnetize this, If I had enough power



**Figure 6.16** Metal rod through the PVC pipe

Matthew inserts the long metal rod into his PVC electromagnet and explains: When I was with Mr. Price, in his class, I had a 12 volt battery with much more power than this (touching the VARIAC on the bench) and I had a rod like this, and when we put the rod through this pipe



**Figure 6.17 I could magnetize this**

Matthew: I could magnetize this (holding a small piece of wire in his hands) simply (as he reaches for a small ceramic magnet) by rubbing it against this magnet (he simulates he rubbing against the metal wire. What it does is (as he speaks a broad smile spreads across his face) I read this.

Inside the metal there are these little domains and they're like arrows pointing in all different ways and then as you rub the magnet across them it



**Figure 6.18 Like arrows pointing in different directions**



It takes and lines them up, so the metal becomes magnetized. The metal has (pointing to each end of the metal rod in turn) a north and South Pole.

**Figure 6.19 It lines them up**

Once he decides that he has assembled at least two working magnets he turns to the motor. He takes the cardboard housing in his hands. The cardboard is weakened in many areas as he has worked with it for various days. He looks around the room. He notes to himself, “ I gotta fix this.” Ian and Matthew look about the room for resources to use for a new motor housing. Nearby, a group of students is using the K-Nex set to build a roller coaster. Matthew realizes the pieces will serve well. He takes a few pieces and assembles a new sturdier housing for his motor. He disassembles the motor from the previous day’s work and reassembles it on its new housing. After a few brief moments, he sets the new motor to work. It runs efficiently from the very first attempt.



**Figure 6.20 Tania, Ian, and Matthew view the new motor**

Tania, a fellow student is near. Matthew explains each one of his electromagnets to her: the coil, the PVC pipe, as well as the copper magnet (which he notes does not work). He shows her each part of the motor and explains how the current creates a magnetic field in the coil, and how together with the surrounding magnets cause the coil to spin. As Tania leaves, other students stop by the bench to observe Matthew’s magnets. Though each of his artifacts represents complex scientific phenomena, Matthew is able to explain how each one works with impressive simplicity. As each of his fellows students approach Matthew demonstrates his magnets. At one point, Matthew sums up his emotions to a

fellow student. Holding the coil of the motor in his hands, he smiles broadly and remarks, “ I’m happy, I’m happy.”



**Figure 6.21 I’m Happy... I’m Happy**

#### 6.4.6.1 The Smile:

I would remember this day on several occasions in the future. As noted earlier, Matthew would leave our academy for one he considered less difficult as he needed to graduate. Given his academic history and the many science math courses in our academy his decision may have been wise as he was able to graduate in the following year. I saw him a year or so after he graduated as he was working at a local retail store. We were both glad to see each other as it had been some time since the motor project. I would see him again a year or so later on the streets of our community. By this time, he was married with one child. We chatted for a while about our families and his future plans. He told me that he had ended his employment as a sales person and had enrolled in a local two-year technical institute to study electronics. It was extremely satisfying to speak with him as he had great expectations for his family and his future.

#### 6.4.6.2 Analysis

Matthews’s work with his electromagnets demonstrates an exemplary level of scientific fluency, but more importantly, his attitude and work methods indicate a strong feeling of membership in the culture of the school science community. His attire is most interesting as lab coats were used only during our regular lab periods, and even then, few students

wore them. I and a few other science teachers were the only ones who regularly used them. On this day, Matthew is the only student wearing a lab coat, however he wears it comfortably as it is now part of his identity. His knowledge of the science of electromagnets is impressive, as he has learned the content from a variety of teachers in a several different fields. When asked a question he does not know, he stops to consider the answer, and when unsure he will easily say, “ I don’t know, I’ll have to figure that out.” His approach to the non-working magnet, illustrated his understanding of the various parts of the circuit, and how to use his equipment to deduce the problem with the magnet. Once he realized that he did not have the proper materials or knowledge, he made the decision to first acquire the requisite resources then return to the problem. This was a most impressive decision. This perseverance was evident in his successful motor project as that too was initially a failure. However, in that instance he had the requisite resources and cultural capital to resolve the issue. All he needed was the time to make the needed modifications. His commitment speaks to his strong internal confidence in his abilities as student. It is a belief that is well founded as his many successes have only increased his sense of possibility as a science student. These are all evidence of a successful science identity and a strong solidarity with the culture of the school science community.

In many ways, Matthew’s project represents a culmination of our many understandings of the structural components of transformative learning environments. Central to these environments is our respect for and efforts to honor the differing cultural perspectives that populate the classroom field. The difficult work of teaching in urban schools begins with our awareness of the cultural difference that exist between urban youth, the school (as social institution) and we their teachers. Such an awareness allows us to effectively communicate and negotiate across difference in ways that engender the trust and mutual respect that are essential to learning environments that maximize student potential.

It is instructive to note the interactions between Ian and Matthew. Although they are from radically different life histories, their interactions are consistently cordial, supportive, and collegial. During their two week project there is not one instance of resistant, oppositional culture, symbolic violence, or activity that might disrespect or disprivilege either Matthew or Ian. It is finally the deepening trust; respect and increasingly positive

emotional energy that together form the foundational to Matthew's successful motor project. These interstitial cultural resources helped him develop the solidarity with the culture of the science classroom and identity of a successful science student. The image of him at his workstation, wearing his lab coat and broadly smiling is evidence of his very positive emotional state and identity as a successful science student.

The availability of a wide range of human and material resources is the second important component of the successful project. As noted, earlier, the budgetary constraints faced by urban schools limit educational opportunity because rigorous challenging learning environments require resources that many schools lack. During his project, Matthew had access to a wide array of human and material resources that together enabled him to understand and build his various electromagnetic artifacts.

The most important of these resources were the coteachers that provided instruction from three distinct areas of expertise. During our SET years, we learned of the importance of community wide interdisciplinary approach to our student's learning needs. In this community, Mr. Koehler, Mr. Price, Mr. Stith (Ian), and I coordinated our efforts on the various May projects. Mr. Price was indispensable as his auto mechanics shop contained the metal and power sources needed to build electromagnets and motors. Co teaching was essential to this project as the three teachers were able to teach canonical science concepts at moments when Matthew was most receptive and eager to learn.

**CHAPTER SEVEN**  
**LESSONS LEARNED**  
**7.1 ACADEMIC REALITIES**

This thesis opened with the story of Matthew and his electric motor in order to document the exemplary science learning that occurs when careful attention is paid to the social, cultural, and emotional dimensions of teaching and learning. Matthew's successful completion of his motor project suggests that the resources within our learning environment helped him establish an identity as a member of the school science community. It was this sense of solidarity and commitment to shared learning goals that motivated him to create the extraordinary display of electromagnetic artifacts he presented on the final day of his project. It is necessary to acknowledge that although his proficient understanding of the science concepts indicates a keen intellect and a genuine desire to learn, Matthew's history of academic underperformance suggests that City High School had not provided him the structural resources needed to maximize his learning potential.

This is often the case in schools located in persistently poor, segregated communities that have been marginalized by the socioeconomic initiatives of mainstream dominant cultural groups. The fiscal and urban social policies that have isolated and impoverished these communities have eroded their ability to properly fund their educational institutions. As a result, inner city schools (such as City High), lack the human and material resources needed to offer educational opportunities that will prove transformative in the lives of urban youth. Understanding that schooling that fails to provide equitable educational opportunity will reproduce marginalized socioeconomic status, this thesis has sought to analyze the structures that constrain (and enable) the agency of students from traditionally marginalized urban populations.

Transformative learning environments do not depend solely on the material resources that structure the classroom. The exemplary learning documented in this thesis occurred because students made a deeply personal decision to fully commit their stores of cultural,

symbolic, and social capital to achieve shared learning goals. This level of engagement develops when students experience strong feelings of solidarity with the culture of the school science community. These feelings of membership develop in classrooms wherein trust and mutual respect are continually co-constructed by all participants in the social field.

Matthew's feelings of solidarity developed slowly over the course of his many successful interactions with his teachers. Ian's patient, supportive teaching fostered genuine feelings of trust and mutual respect as resources in their social field. The resulting positive emotional climate helped create the interstitial space wherein Matthew could forge his science identity. The image of Matthew (wearing his lab coat) seated at a workstation surrounded by his many tools and electromagnets is evidence of his successful identity. His closing statements, "I'm happy with this, I'm really happy" provide further proof of the positive emotions he experienced during his learning. Thus although he had all of the requisite human and material resources at his disposal, it was his subjective affiliation with the culture of the school science community that motivated him to use our material resourced to learn science in a way that proved educative and transformative in his life.

In concluding this research, I will review the structures that I feel are necessary components of transformative learning environments. I begin with an analysis of the sociocultural perspectives that facilitated my initial enculturation into the City High School community. Trust, mutual respect and a willingness to communicate | negotiate across difference were the resources that structured our successful cultural alignment. They have remained as indispensable components of my daily praxis and they are the basis of my ongoing evolution as urban educator.

## **7.2 RESPECT, MUTUAL TRUST AND CULTURAL ALIGNMENT**

### *7.2.1 Socio-Historical Perspectives*

I have framed my analysis of the constraints to transformative learning within a historical, social-cultural framework because the array of cultural perspectives that converge in the urban science classroom, can occasion misunderstandings, instances of symbolic violence, and resistant oppositional culture. My first months in City High

school were a time when cultural misalignment occasioned many contentious encounters with students who positioned me as a cultural other and refused to accept me as a viable member of the school community. In order to address the cultural divide that existed between us, I had to first understand why my students resisted and opposed my efforts to teach them. Upon reading the literature of cultural sociologists, I learned that the divide that so constrained my relationship with my students was the result of our differing life narratives and the resulting cultural difference that problematized the simplest of social interactions.

An essential factor in my understanding of student culture was my study of the historical trajectory of the demography of the communities in which they live and grow. Although one should not make a direct correlation between conditions of poverty and cultural perspective, understanding my students' life worlds provided salient insights into the cultural codes that informed their social practices. Analyzing my students' cultural perspectives necessitated an analysis of my own life history in order to understand how our differing cultural narratives occasioned the difficulties in our classroom. Once I was aware of the cultural implications of teaching in the urban setting, I was able to interact with my students in ways that communicated my deep respect and genuine desire to help them maximize their learning potential.

### *7.2.2. Conversations across Difference*

The resolution to the altercations, and misunderstandings in my classroom came about through conversations. During our discussions, each participant was able to voice their opinion of classroom realities they felt were unfair or disrespectful. We were therefore able to appreciate the perspectives of other members of the classroom community. Trust was established because our dialogues existed in a social space free of traditional power asymmetries: no one voice was privileged; thus, each member was treated as an equal co-participant. Respect was communicated by our willingness to change our perspective and negotiate changes in the classroom structure. In this manner, we co generated solutions to the contradictions that constrained our agency. It was our efforts to genuinely communicate | negotiate across difference that helped bridge the cultural divide between my students and me.

### *7.2.3 Critical praxis*

It is important to note that our efforts to foster cultural alignment demands constant vigilance as the convergence of differing perspectives will continue to create contradictions in the classroom field. These contradictions can at any moment occasion symbolic violence or disrespectful actions (by teachers) or resistant oppositional culture (on the part of students). The resulting discord will engender a negative emotional climate, fracture solidarity, and perpetuate cultural dissonance. It is therefore vital that we continually reflect on our actions to determine if we are faithful to our values as critical educators. My experiences have taught me that the construction of trust and mutual respect is an ongoing process that should not be taken for granted. My failure to continually assess my interactions with my students occasioned many instances in which I marginalized and shut down students as a result, of their difference. These errors remain as discomfoting realities of my history at City High.

## **7.3 REQUISITE RESOURCES IN TRANSFORMATIVE LEARNING ENVIRONMENTS**

### *7.3.1 Theoretical perspectives – Collegial Reflective Practice*

My initial understanding of the cultural implications of teaching resulted from my reading of research undertaken by fellow teachers in my school. Were it not for those first articles I would not have learned how to address the cultural divide in my classroom. Subsequent to that, I became a member of the DUS, and engaged in continuing work as teacher-researcher. The ongoing infusion of provocative theoretical perspectives challenged my beliefs and teaching practices; while my work in the classroom often necessitated a reformulation of theory. This recursive dialectical relationship between theory and praxis formed the basis of my transformation as urban educator. As educators, we are often consumed by the day-to-day exigencies of teaching. We work as isolated individuals, with little time for extended intellectual discussion of our teaching philosophies, or pedagogical beliefs. Our practices are often disconnected from any theoretical perspectives: moreover, we seldom engage in communal discussion of praxis or self-critique of our teaching styles. My involvement in the DUS provided a forum wherein I (and fellow teacher-researchers) could regularly critique praxis in light of

emerging theoretical perspectives. In this way, I could continually develop as teacher and educational theorist. It was this interplay of theory and praxis that catalyzed my transformation as urban educator and that of our learning community. Although the DUS officially ended in 2003, my connection to a community of educational theorists remains as a backdrop to my continuing evolution as an educator. The recursive relationship between theory and praxis never ends, as there are continuing contradictions in our classrooms that require analysis and critique. Thus, a firm relationship to a community of teacher-researchers is an indispensable component of continuing transformation of educators and learning environments.

### *7.3.2 Coteachers*

Throughout this thesis, I have noted that my successful enculturation as well as the transformation of our learning communities resulted from the influx of a wide array of human and material resources to my classroom. The most important of these was the presence of coteachers (student teachers, university researchers, and other teachers) that provided our students the close educational support they needed. In each of the narratives of exemplary learning, one finds coteachers providing students the educational support that will maximize their potential. It is within the moments of patient, supportive instruction that successful encounters occur and positive emotions emerge. The many instances of Ian supporting Matthew during his motor project, or Mr. Chris teaching the students in the Labs at Penn, (and the many other instances documented in the work of the DUS) are all positive social encounters that help students build successful science identities within the culture of the school science community. Additionally coteachers provided me the opportunity to learn about my students, and forge personal relationships that my duties as teacher would have otherwise precluded. When Jen and Brian (my first two coteachers) became part of my classroom, I was able to deepen my understanding of my students' learning needs and make appropriate adjustments to the curriculum. These insights not only helped improve the learning for my students, but it also increased their faith in our efforts on their behalf. In many of the arguments that occurred in my classrooms, coteachers helped resolve the disagreements. In this way they facilitated the communication | negotiation across difference that increased trust and mutual respect in

our learning community. The benefits of coteaching are so far ranging that it is difficult to conceive of successful teaching | learning occurring without their presence.

### *7.3.3 Boundaries of the Classroom field*

Although the narrative of the transformation of our learning community was quite positive, the reality was that many students behaved in a manner that was not appropriate for the learning of science. As noted earlier, the boundaries of all social fields are porous and culture from one field can easily cross over into another. Given the history of the school and that of the surrounding communities, many of our students continually enacted street culture within the bounds of the classroom. Our successful transformation of our community necessitated that we define activity that was not conducive to successful learning. Many of these actions were easily disallowed as they were of a violent, dangerous nature. Activity such as physical aggression, willful destruction of property, thievery, and other violations of school codes were easily disallowed. Enactment of any such forms of conduct was quickly and efficiently sanctioned. Other behaviors were not so easily disallowed, as they were part of student culture that we could not easily disqualify. In these instances we discussed (as a community), the kinds of behaviors we wished to include or exclude from our classroom. As noted in our community mission statement, all members of the school community as well as parents were included in our response to inappropriate behaviors. In this way, we as a community defined acceptable cultural production.

### *7.3.4 Cogenerative Dialogues:*

While our policies were effective, our use of cogenerative dialogues helped resolve contradictions in ways that made everyone feel an equal participant in the creation of our learning community. This thesis has included several cogenerative dialogues to illustrate how we deconstructed events in ways that helped teachers and students learn more about each other and resolve instances of misbehavior and fractious encounters. While coteachers provided the human resource that helped construct respect and trust between participants in our learning community, cogenerative dialogues that provided the mechanism through which we constructed these resources.

A major flaw in my praxis at City High was my underuse of cogenerative dialogues. Although cogenerative dialogues were used to address contradictions in the classroom, I failed to use them when contradictions were not obvious to me as teacher. Had I done so, I would have realized that many of my students were not engaging in their learning because there were structures in the classroom field that constrained their agency. Ongoing cogenerative dialogues would have given these students a means to articulate which structures were constraining their learning. Although it is not certain that I was the cause of their lackluster engagement, cogenerative dialogues would have helped me identify the resources that would have enabled their agency.

### *7.3.5 Material Resources:*

The exemplary learning documented in this thesis was enabled by resources that we used to create a rigorous, evocative science curriculum. Our in-class inquiry activities, science laboratories, the May Projects, and the Labs at Penn were possible because our community had access to high quality science equipment, chemicals, and technology. By the spring of 2002, our learning community had acquired sufficient learning materials so that our students could carry out virtually any scientific investigation. If we were lacking a needed resource, thence we could reach out to several community partners for assistance.

Access to science equipment, technology and well equipped learning spaces is a difficult challenge in the urban setting because most inner city neighborhood schools have low operating budgets and cannot make large expenditures on science equipment. As a result, many urban educators will be forced to teach with limited material resources. This is truly unfortunate, because access to good quality science equipment is an essential component of transformative learning environments. Although it is true that exemplary science learning is not wholly dependent on material resources, it is clear from our experiences that our access to a vast array of human and material resources facilitated the successful transformation of our learning community.

*7.3.6 Transformations: Coherence and Hidden Contradictions*

An underlying theme of this thesis is that of transformation, as numerous facets of my praxis have changed considerably in my three years at City High. Similarly, many contradictions within our small learning community were resolved as a result of our collaborative research-teaching efforts. The resulting coherences in our praxis made the SET community one of City High Schools, most effective learning communities. It is however important to note that coherences always exist with associated contradictions, and it is the resolution of those contradictions that provide the impetus for our continuing development (Sewell, 2005). Once a contradiction is resolved, one should look for other contradictions: in this manner, our transformations never truly end.

My assumption that I had become a successful educator, led me to believe that my transformation had reached a stable end. This belief led me to focus on the coherences within my praxis and I failed to see the many contradictions remaining in my classroom. As a result, my assumed identity not only disprivileged many students, it also truncated my evolution as educator. These oversights were part of the reason that I failed to fully engage students like Matthew in cogenerative dialogues that might have helped restructure the classroom-learning environment. Had this occurred, he might have been able to display his exemplary possibilities long before the final weeks of the school year. Thus while many aspects of my praxis were transformed during my years at City High, I did not develop as fully as I could have.

Although this thesis ends with critique of my praxis, I feel that my awareness of the flaws in my teaching bodes well for my ongoing evolution as educator: for it is our understanding of the contradictions in our praxis that creates the conditions for our continuing transformation. Focusing on the coherences in our work lulls us into a false complacency that stifles growth.

Our development is however, highly dependent on the structural resources that help us identify and resolve contradictions in our praxis. Without those structural supports, teachers will find it difficult (if not impossible) to continue their evolution as critical educators. In such circumstances, contradictions will remain as constraints that truncate

our ability to structure learning environments that will prove transformative in the lives of our students.

## **7.4 CONSTRAINTS TO TRANSFORMATIVE PRAXIS**

### *7.4.1 A New School: Fall 2010*

In the fall of 2010, I joined the teaching staff at an inner city school near University City. I chose the school because it was in many ways similar to City High School. It was a new school and I was eager to help build a rigorous, challenging science curriculum. My experiences as a “new teacher” in the school were remarkably similar to my first months in City High as students refused to accept me as a viable member of their school community. Given my lack of social capital, students felt free to disrupt the class, misuse science equipment, or openly defy my authority. Though my interactions with students were extremely discomforting, my experiences had taught me that time was needed for my students and I to become accustomed to each other. Over the first few months, I paid close attention to the ways in which our cultural perspectives differed in order to minimize interactions, which my students might perceive as symbolically violent. Teaching remained a precarious endeavor as the many contradictions in the classroom field could occasion fractious confrontations at any moment.

Though there was a great deal of opposition and resistance in the class, I felt confident that the resolution of these contradictions would provide insights on how to structure an exemplary learning environment. My experiences at City High proved very useful during this time, as I was able to slowly bridge the cultural divide between us. As the months passed, the degree of misbehaviors lessened and I could sense a marginal improvement in my relations with my students. Thus, I began to believe that over time this teaching environment would transform in much the same manner as had occurred in City High.

However, as I analyzed my teaching practices, I was forced to admit that the “improvement” in my classes was superficial, as I had not forged a successful identity as a science teacher in this community. The disruptions that ensued whenever I attempted to engage students in inquiry activities or open-ended laboratories affirmed their disinterest in me or in the science curriculum. Understanding that there were structures in our class

that constrained our agency, I attempted to use cogenerative dialogues as a method to resolve those contradictions. This would prove futile, as conditions in the school district had changed considerably since my days at City High School.

#### *7.4.2 Mandated Curricula*

Although I engaged my students in cogenerative dialogues, we were unable to alter the classroom structures, as I had no power to modify the curriculum or enact changes in my teaching practices. Teachers at my school (and in all of Philadelphia’s lower performing schools) were forced to follow a (closely monitored) mandated curriculum that controlled every aspect of our professional practice. The content of our lesson plans, sequence of topics, the selection and pacing of teaching strategies, were determined by administrators and school district personnel. All teachers of a given subject were expected to teach the “eligible content” as directed by the school system’s planning and scheduling timeline. Weekly (announced and unannounced) formal and “informal” observations assured “compliance” with school district mandates. Formal memoranda of non-compliance were placed in the personnel folders of those who failed to follow administrative directives.

My experiences have taught me that each classroom is unique and demands a curriculum that meets the needs of the particular individuals within that classroom. As such, there can be no mandated curricula capable of addressing the learning needs of the very diverse student populations that converge within the urban science classroom. While I am aware that school systems need a degree of control over the enacted curriculum, the degree of homogeneity that we teachers must conform to, denies any possibility of providing a transformative education for our students. In attempting to provide a standardized curriculum, current educational reform policies enforce an oppressive conformity that negates any possibility of our ongoing transformation.

### **7.5 HEGEMONY OF MANDATED CURRICULA**

#### *7.5.1 Agency and Continuing Transformation*

Given that contradictions are always present in the classroom field, educators need the freedom to analyze their classroom practices and make adjustments that meet the needs of their diverse student populations. Central to this ongoing analysis are cogenerative

dialogues that solicit the input of all participants in the various fields nested in the school. In this manner, both the educator and the learning environment are able to continually transform to meet the needs of the participants in the classroom field. Ongoing transformation also depends, on the freedom to engage in collaborative research with like-minded educators so as to continually infuse praxis with relevant, provocative theoretical perspectives. Additionally classroom educators need administrators that will mitigate the incursion of district mandates so that teachers have some degree of professional control over their classrooms. In our efforts to transform learning in City High, it was the principal, and our coordinator that provided the resources and the professional freedom to engage in transformative activity. Without these various components, continued transformative praxis in the urban setting will cease.

The question is how can educators meet the needs of their students if they are not afforded the resources or the professional freedom to alter the structures in their classrooms? If current initiatives persist, educators will not be able to create environments that meet the needs of their unique student populations. The tragedy will be that many gifted students (like Matthew) will once again become marginalized casualties of a system that sees only their deficits, but fails to notice their inherent potential.

### *7.5.2 Reality of Mandates*

My last year within the school district suggests that even a skilled experienced educator cannot create a transformative learning environment without the requisite resources, administrative support, and (more importantly) the professional freedom to fashion a curriculum that meets the needs of his particular student population. The continued barrage of mandates, prescribed curricula, and enforced pedagogical practices deprofessionalizes and demoralizes educators who realize they are not providing a truly rigorous education to their students.

### *7.5.3 Unequal Mandates*

The requirements of mandated curricula are disproportionately enforced upon poor, low performing, predominantly African American schools (such as City High school). These institutions are more stringently monitored because they rely heavily on funding from the

federal government and must therefore meet standards for adequate yearly progress. Their “history as a failing institutions” has made them the responsibility of “reform commissions” with extraordinary power over the day-to-day school operations. It is interesting to note that schools in affluent neighborhoods are able to opt out of reform initiatives and provide their children education that is responsive to their unique learning needs. Urban schools however must labor under the hegemony of reform officials who believe that improving test scores and academic skills will rectify a history of educational inequality.

The political history of communities like West Philadelphia, offers clear evidence of the effect that historical processes of economic and racial oppression have had on the quality of educational opportunity in persistently poor segregated communities. However, the deficit theorists responsible for current educational policy refuse to consider the effects of the historical processes that have created such deficient educational systems. Their exclusive focus on prescribed teacher practices, “lock step” sequenced curricula and normative assessments evidences their belief that the academic “underperformance” of urban youth can be ameliorated solely by achieving proficiency on standardized tests.

Such a reliance on normative achievement tests gives school districts and local governments the false impression that they are providing our children an education that will break cycles that reproduce poverty and unequal social status. The continuing decline of economic opportunity increasingly segregated, isolated neighborhoods suggest that we are not providing urban youth the transformative educational opportunity they so richly deserve.

## **7.6 CONTINUING THE EVOLUTION OF TRANSFORMATIVE PRAXIS**

### *7.6.1 Identity of Beginning Teachers*

Current educational policy initiatives pose serious risks to the development of novice teachers who have yet to shape their identity as professional educators. The barrage of administrative mandates, prescribed curricula and scripted pedagogy deny them the opportunity to create learning environments that reflect their cultural perspectives and personal philosophies of teaching and learning. Thus at the onset of their careers, these

beginning teachers are unable to establish the norms and criteria by which to reflect on, critique, and (more importantly), improve their daily praxis. Moreover the requirements of a prescribed pedagogy do not permit them to adapt the learning environment to suit the needs of their students. The restrictions placed upon them, thwarts their development as they can neither learn from nor correct the contradictions that arise in their classrooms. Although many have insights as to how to help their students, they are required to enforce district policies that often do little to help their children learn in ways that might prove transformative in their lives. For many of these teachers, the combination of their inexperience and the futility of trying to work in a system that provides them little critical voice, turns an already difficult first year into an almost impossible barrier. As a result, many of these talented, highly intelligent young educators opt out of teaching in urban school systems that sorely need their energy and genuine concern for the well being of our children.

#### *7.6.2 Sustaining Critical Perspectives*

These realities place an added responsibility on post secondary science educators who must prepare pre-service teachers for the constraints they will face. It is particularly important that new teachers understand that school officials will not readily provide them the freedom to address contradictions in their classroom field. Unless administrators are willing to create structures, which will afford the agency of their staff, teachers will be unable to enact substantive changes to either their curriculum or their pedagogical practice. Preparing our students for such an eventuality will ameliorate the impact of the restrictions in their practice and help many to maintain their enthusiasm for teaching in the urban setting.

Framing our education courses within critical sociocultural perspectives will provide our students an understanding of the social, cultural, and political implications of teaching in the urban setting. Including methods through which to analyze the social history of the communities in which urban schools are embedded will provide a critical awareness of the economic and political initiatives that have shaped local and national educational policy. Such a discourse would provide our teachers the philosophical frameworks needed to sustain their critical pedagogical perspectives. In the absence of a critical

discourse, many beginning teachers will succumb to the hegemony of the never-ending restrictive mandates and cease their efforts to enact a transformative curriculum. Without a cadre of educators willing to address existing inequity in our schools, classroom structures that disprivilege urban youth will remain hidden and uncontested.

### *7.6.3 Science Education Research*

Critical science educators therefore, need to engage in research that provides alternatives to the philosophies that dominate our existing educational discourse. Our research agenda needs to expand our understanding of the structures that facilitate the genuine communication | negotiation across difference that engenders trust and mutual respect between all participants in the classroom field. Central to this work is the ongoing exploration of the sociology of emotions and the relationship between positive emotional energy, solidarity, and the creation of successful school science identities. These are the interstitial cultural resources that encourage students to fully deploy their stores of capital to learn science in ways that are personally relevant, educative, and transformative in their lives.

It is incumbent upon us to continue to continue the research efforts that evidence the exemplary learning that occurs when proper attention is paid to the social, cultural, and emotional dimensions of the learning environment. Our findings contradict existing educational policy that insists that standardized achievement on state's mandated assessments provide the only proof of proficient understanding. The narratives of extraordinary science learning documented in this thesis proves that such is not the case.

## **7.7 A FINAL THOUGHT**

This thesis opened with the story of Matthew's electric motor because it was the culmination of three years of cultural work in the communities of City High School. The success was the result of many individuals and resources that together provided the structures that enabled his exemplary display of scientific fluency. Mathews' deep understanding of the science of electromagnetism illustrates the incredible intellectual

potential of students from traditionally marginalized urban populations. His success (and that of countless students in the research literature of the DUS) demonstrates what is possible within urban schools if teachers and students are given the proper structural supports and resources.

Though my voice is central to the narration of this work, these successes, and the transformative culture of our classroom community was the result of the collaborative practice of many researchers, coteachers and administrators, who shared a deep respect for our students and a sincere desire to positively affect their lives. It is this desire that brought us together over the course of these three years, and it this desire that has motivated the writing of this thesis.

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APPENDIX A-1

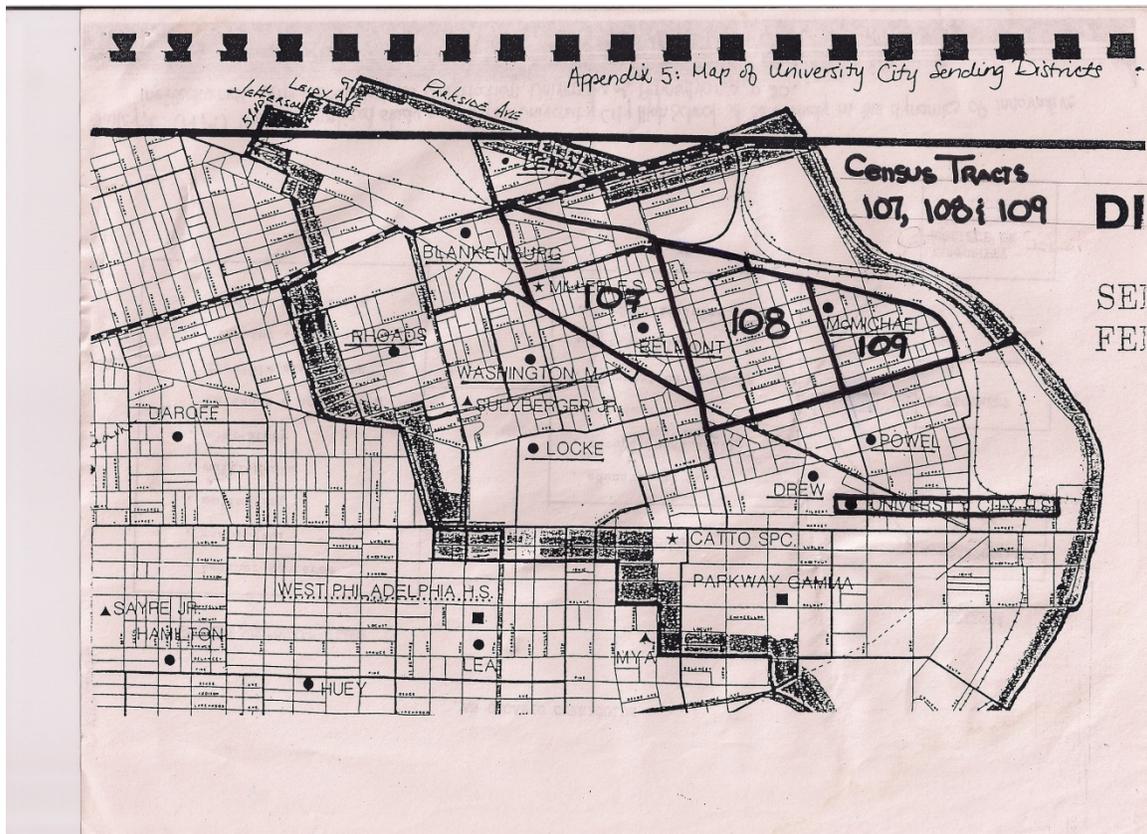


Figure Appendix A-1 Census tracts in City High school feeder pattern