

Science and Mathematics Education Centre

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

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**This thesis is presented for the degree of
Doctor of Philosophy
of
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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:

Date:

DEDICATION

This dissertation is dedicated to:
the memory of my mama, Wanda Jean Martin and my grandfather, Franklin Eugene
Martin (the only daddy I have ever known);

my Nanny and Jim, without whose love, support and tenacity,
not a word would have been written;

and to my Mamaw, Papaw, sister, aunts, cousins and ancestors who have kept me
laughing, kept me trying, and kept me focused on living and loving to the fullest.

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ABSTRACT

This critical ethnography focused on improving the teaching and learning of chemistry in a diverse, urban, tenth-grade classroom in high-achieving magnet high school serving students of differing cultural, social, and historical backgrounds. Participants included all 26 students in the class, a university researcher (Sarah-Kate LaVan) and me as a teacher-researcher. Conducted within the methodological and theoretical frameworks of critical ethnography, this research employed collaborative research, autobiographical reflection, the sociology of emotions, and cogenerative dialogues as tools by which to examine the influence of structure and the social and historical contexts of lived experiences on teacher and student practices in the context of the science learning that took place in our classroom.

The methods employed in this ethnography were designed to catalyze social transformation by identifying contradictions within structures and then finding ways to alter these structures to expand the agency of all those involved. Specifically I asked the following questions: 1) How do practices and schemas gained by being within school structures afford the structures of the classroom field? 2) How can the structures of the classroom be transformed to allow students and teachers greater exchange of capital (social, cultural, and symbolic)? 3) How does the exchange of capital afford agency for the participants? 4) How can participants' actions transform the structures associated with school and the classroom to break cycles of reproduction? Using multiple data resources such as field notes, videotape, interviews and artifacts, our research team was able to elicit and support findings at micro-, meso-, and macroscopic levels to answer these questions.

This research provides evidence of the ways in which structure shapes and is shaped by the practices and beliefs of students and teachers in different fields and how those, in turn, structure fields and afford agency for both the individual and the collective. The major findings of the study reveal that students and teachers need to participate in structured conversations that explicitly define and negotiate roles and rules for successful classroom interactions. One way to accomplish this is via participation in overlapping fields of cogenerative dialogue, a feature of our research methodology that emerged as salient during our research. This study offers administrators,

teachers, and students a means by which to evaluate the ways in which structures shape the learning environment. Coupled with cogenerative dialogue, participants are provided a pathway for expanding agency in the classroom and in the school.

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CHAPTER 1

THE PROBLEM

[Kids]

I know I can (I know I can)

Be what I wanna be (be what I wanna be)

If I work hard at it (If I work hard at it)

I'll be where I wanna be (I'll be where I wanna be)

[Nas]

Be, B-Boys and girls, listen up

You can be anything in the world, in God we trust

An architect, doctor, maybe an actress

But nothing comes easy it takes much practice

(Nas, lyrics from “I can,” 2002).

The first time I heard this song on the radio, I felt a flood of mixed emotions. Hearing the children in chorus, singing about how they could accomplish their life goals if only they worked hard made me sad. When I saw the video later on *Urban Xpressions*, a locally aired late-night show, I cried as the small children danced around Nas on the urban landscape. I cried because it was not true. I cried because I knew it was a lie.

1.1 INTRODUCTION

Adults love to ask children, “What do you want to be when you grow up?” Everyone has been asked this question at some time or another and most children respond with a favored vocation, “Doctor.” “Lawyer.” “Marine Biologist.” They might choose a title that is portrayed positively in the media or is perhaps a vocation for someone the child knows, like a parent or neighbor. But how realistic is it for that child to actually *become* what she¹ wants to be when she grows up? How likely is it for a child who hopes to become a doctor, lawyer, or marine biologist to actually realize his or her dream? For the millions of youth living in poverty in America today, the goal of becoming a doctor or marine biologist remains as elusive a dream as becoming an NBA basketball player.

^{1 1} To avoid cumbersome construction I use she and her to refer to third person throughout.

As a science teacher in an urban school district I have had many experiences with urban youth, mostly minorities, who labored under the misconception that their failure to meet their goals and feel successful, both in academic and life goals, was due to their own failure to “work harder.” Many of these students and their families have dreams and goals for their futures and most see education as the only means by which to secure these goals. When these children begin to fail in school, students and parents often blame themselves or their circumstances for lost opportunities. But do opportunities for success really exist for all Americans? The sentiment expressed in this popular rap song by Nas is a modernized re-telling of the American dream: everyone who is dedicated and works hard can achieve their goals, even if it means pulling themselves up by their own bootstraps to do so. But for most children living in poverty-stricken urban and rural America, the probability that they can “be what they wanna be” remains very, very small.

1.1 Schools Failing Students and Students Failing School

Penelope Eckert (1989) asserts, “the means by which children reproduce the experience of their parents are intricately woven into the fabric of society, and thus school” (1989, p. 8), and nowhere are these patterns of social reproduction more apparent than in the urban educational system where youth are failing and being failed at an alarming rate. These failures relegate children attending urban public schools to the bottom of the socioeconomic ladder, leaving little opportunity for realizing their dreams. Traditionally, teaching and learning have been thought to be highly dependent upon the extent to which learners wanted to participate and learn and how well teachers were able to manipulate their classrooms to make them more conducive to learning (Tobin, Elmesky, & Carambo, 2002). Until recently, little consideration has been given to the practices associated with learning as related to culture and the social structures (both ideological and physical) in which curricula are enacted. The focus of this research is on examining the structure and practices of both students and the teacher in a science classroom as a means to transform the learning environment to meet the needs of urban youth in an attempt to provide *real* opportunities to achieve their goals.

In the sections that follow, I illustrate some of the issues facing urban educators and their students, many of which directly influence their abilities to successfully teach

and learn science in these schools. Specifically, I argue that these issues are not divorced from the greater hegemonic structures associated with socioeconomic status and race in America where the inequalities in education experienced by youth are based largely along racial and class lines, both of which serve to reproduce these social hierarchies. Second, I describe the cultural differences between teachers and their students and how those differences may serve as a barrier to effective teaching practices and the development of a cohesive classroom environment that is conducive to learning. Finally, I provide an overview of literature that suggests the need for teachers to examine the structures associated with the learning environment in conjunction with social and historical contexts of past educational experiences to inform and transform their interactions with students of varying cultural backgrounds.

The exploration of these issues is critical in that it serves to frame the context of this dissertation by illustrating some of the structures that afford the interactions between students and teachers in urban classrooms. These issues serve as a backdrop for my evolution from struggling new teacher to a successful urban science educator. Further, in this chapter I expound upon the focus of the dissertation where I discuss the importance of social and historical contexts of learning to teach and teaching to learn and how these experiences afford the development of student and teacher practices and beliefs.

1.2 OPPORTUNITIES LOST

In his work exploring the equality of educational opportunity, James Coleman (1968) stated that the “common educational experience implies that this experience has only the effect of widening the range of opportunity, never the effect of excluding opportunities. But clearly this is never precisely true so long as this experience prevents a child from pursuing certain occupational paths” (p. 11). America has long been represented as a nation where lack of ambition and idleness, rather than gender, class, and race are seen as the only legitimate obstacles preventing a person from achieving the upward mobility characterized as “the American Dream.” But for many Americans today that live in urban and rural areas, daily life is filled with poverty, hunger, lack of opportunity for employment and education, and myriad other nightmarish obstacles that must be overcome just to make ends meet. Despite

the widely accepted hegemonic ideologies that everyone in America is *created equal* with equal access to resources and opportunities to succeed, there exists a social structure that shapes the life chances of poor youth, especially those living in the inner-city where greater numbers compete for already depleted resources.

An example of a structure that shapes the lives of students, ensuring that some students have greater access to opportunities than others, is tracking. Tracking is a common practice in schools, serving to separate students into differentiated curriculum “tracks” based on “ability” in an effort to fit curriculum to the needs of the student. It is widely reported that in the American school system impoverished students and minorities are over-represented in the lower ability tracks while White middle-class students fill the majority of courses in the middle and upper level tracks. Coleman (1968) states that these differentiated secondary curriculum procedures “[have] the effect of not only keeping open the opportunities that arise through continued education, but also of closing off opportunities” (p. 11). He continues by saying that the amount of opportunity one has to succeed can then “be measured in terms of the level of curriculum to which a child is exposed where the higher the curriculum made available, the greater the opportunity” (1968, p. 11). For inner-city youth who are schooled in dilapidated buildings lacking instructional materials and qualified teachers, Coleman’s argument would suggest these students’ opportunities to succeed are cruelly deficient. These oppressive institutional structures make it nearly impossible for urban youth to escape the cycles of poverty that ensure the social reproduction of the underclass. Hence these structures maintain the reality of privilege, oppression, and the social hierarchies of race and class in America while conveniently providing a means by which to blame those who *fail* to succeed within a system based on *equal* access and opportunity.

1.3 URBAN EDUCATION: IN A STATE OF EMERGENCY

1.3.1 The Realities of Urban Schools

For many urban youth, school presents itself as a hostile environment. The rules and expectations of the schools’ administrators and teachers are enforced with prison-like authority, beginning with the metal detectors and policemen that greet them at the door each morning. Clad in their school uniforms, student individuality is lost as they make their way to their insufficiently funded classrooms to be taught, more often

than not, by under-qualified teachers (Darling-Hammond, 1987) who may or may not be teaching in their field of study (Ingersoll, 1996, 1999). Students in these classes read from books that are ten or more years old, if they have access to curriculum materials at all.

Additionally, the schools are often very large, thus, creating a sense of anonymity among many students and teachers who experience isolation in these large, comprehensive urban high schools. During the 2001-2002 school year, the majority of all public schools (57%) were in large urban and mid-size cities with populations exceeding 250 000 people (National Center for Education Statistics [NCES]², 2003). Urban schools accounted for 69% of all public school students and a majority of these students were minorities coming from low socioeconomic backgrounds (NCES, 2003). Based on statistics from the NCES (2003), urban students are twice as likely to be living in poverty, are more likely to speak English as a second language, and far more likely to drop out of school than their non-urban counterparts.

1.3.2 Inequality in Resources

Teaching in an urban setting is challenging for many reasons. Run-down facilities, overcrowding, a lack of resources (Tobin, Roth, & Zimmerman, 2001) and insufficient funding (Anyon, 2001; Ingersoll, 1996) for programs are but a few of the problems facing educators in today's urban schools. Urban schools currently suffer critical shortages of teachers as a result of high turnover and the reluctance of teachers to take jobs in such schools. In particular, the fields of special education, math, and science experience the highest teacher turnover rates (Ingersoll, 2001, 2003; Ladner & Hammons, 2001). A study released by the Urban Teacher Collaborative (2000) reported that 95% of urban high schools are in dire need of "certified math and science teachers." This is the case in Philadelphia public schools where 52% of the teacher cohort that began in 1999 had left their school and/or the district by 2002 (Neild, Useem, Travers, & Lesnick, 2003).

The teaching and learning of science in urban schools is a challenge that ranks among the most significant faced by educators, especially in large cities in which

² National Center for Educational Statistics. (May 2003). U.S. Department of Education Overview of Public Elementary and Secondary Schools and Districts: School Year 2001-02. Document retrieved online August 2003 on the World Wide Web: <http://nces.ed.gov/pubs2003/overview03/>

poverty and race are critical issues. The gaps in science achievement between minority and White students and urban and suburban students are increasing (Ferguson, 1998; Norman, Ault, Bentz, & Meskimen, 2001) while severe inequities in human and material resources in urban schools (Kozol, 1991) continue to plague urban school districts predominantly serving America's poverty stricken minorities. As there are few models that run counter to this trend, the future appears bleak as large school districts in the United States experience chronic budget shortfalls (Ingersoll, 1996) and the potential of a takeover by their state. Given all of the obstacles facing students and teachers in urban schools, it is little wonder that these schools, as structured, are failing to provide both students and their teachers with the tools they need to succeed. This study seeks to challenge the notion that successful teaching and learning in urban schools can be achieved by simply providing more human and material resources to impoverished schools. While the provision of adequate curriculum materials and qualified teachers is a key component, it is crucial that educators realize the importance of the cultural and historical contexts in which science is taught and learned if we are to effect real and sustained changes in the state of urban education.

1.4 CULTURAL AND HISTORICAL CONTEXT IN EDUCATION

1.4.1 The Role of Culture and Context in Learning

Jerome Bruner (1996) states that "the human mind is both constituted by and realized in" the use of human culture. This suggests that learning and thinking are always situated in a cultural setting and always depend upon the utilization of cultural resources. Thus, the variation in the utilization of the human mind can be directly related and attributed to differences found in different cultural settings (Bruner, 1996). This given, humans in different cultural settings could create and transform different meanings from the same situations due to individual and cultural variation. According to this approach, it is easy to understand how context impacts an individual's learning experiences. Once it is recognized that learning is situated in social settings and that the meanings made while engaging in activities within these settings are embedded within social contexts, one can appreciate the importance of cultural and historical contexts in relation to teaching and learning.

1.4.2 Teachers and Minority Students in Urban Schools

In Lisa Delpit's book *Other People's Children: Cultural Conflict in the Classroom* (1995), she observes that "one of the most difficult tasks we face as human beings is communicating meaning across our individual differences...a task confounded immeasurably when we attempt to communicate across social lines, racial lines, cultural lines, or lines of unequal power" (p. 135). This is particularly poignant given that students of color are expected to constitute a majority of all K-12 students in the United States by 2035, yet almost 84% of the current teaching force is White (and majority female) while nearly 40% of their students are minorities (NCES³, 2002), a proportion not expected to diminish significantly in the near future (Ladner & Hammons, 2001; Villegas & Clewell, 1998). Contributing to this disparity is the fact that fewer minorities are seeking to become teachers while the minority student population continues to increase. This is particularly true in urban schools "where seventy-seven percent of the students are both non- [W]hite and live at or below the poverty level" (Anyon, 2001) and where the teaching population is increasingly different from their students in terms of race, ethnicity, and socioeconomic status (Banks, 2001; Ladson-Billings, 1994). Swartz (2003) notes that the "national trend of a steady decrease in teachers of color further increases the likelihood that students of all cultural backgrounds will be taught by White teachers" (Banks, 1991; Gomez, 1996; Zeichner, 1996 as cited in Swartz, 2003, p. 255).

1.4.3 Cultural Other

That the teaching population is becoming less diverse while the student population is becoming more diverse has important consequence for students of color who are being taught by White teachers who Swartz (2003) characterizes as having "perceptions of these communities [of color] that are largely media based and exogenous" and who "typically have low expectations and conscious or unconscious racist assumptions about the supposed deficiencies of people of color" (p. 255). For White teachers who have had little contact with students of color or communities of color, expectations and assumptions about ability and norms of behavior can greatly affect classroom interactions between these teachers and their students. In many

³ National Center for Educational Statistics. (2002). Digest of Education Statistics, 2002: Chapter 2. Elementary and Secondary Education Table 101 - Teacher enrollment.

instances, not only do these teachers differ in race and ethnicity, but also in social class, positioning these students as a “cultural Other” in all respects.

1.4.4 Through a Deficit Lens: The Changing View of “Others”

In the past, “otherness” has been used to provide a causal explanation for low achievement by poor minorities, specifically those in large inner cities. This culture of poverty concept was used in urban educational reform programs in the 1960s and 1970s to help teachers compensate for what was lacking in the lives of urban youth who were characterized as “culturally defective or deprived.” John Ogbu (1978) commented that these “compensatory education programs, based on cultural deprivation theory, are designed either to make up for the assumed deficits that cause [B]lack children to fail in school or to prevent such deficits from developing in the first place” (p. 81-84). These reform programs permitted educational policy makers to place the blame for minority failure on the families and communities from which these youth came rather than implicate the educational system in which they were being failed. Kimani Toussaint (1997) notes that historically, those who supported this theory purported that “[B]lack parents devalued education and did not foster in their children an observance of would-be middle-class injunctions concerning hard work and moral rectitude” (p. 36). This formulation suggests that the cause of failure and poverty among urban minorities is due to their own action rather than those of others, effectively making teachers and the education system inculpable in the failures of minority children.

Jacqueline Irvine (1990) noted that many educators “speculate that low-income [B]lack children bring to school a set of antisocial behaviors and traits that emanate from a culture of poverty. They rationalize their harsh treatment of these children by citing instances of an undisciplined and unstructured homelife...” (p. 17). Indeed, this popular stereotype encouraged teachers to believe that poor minorities “suffered from a cultural deficit that retarded their ability to learn or to behave with civility and appropriate decorum” (Toussaint, 1997, p. 352). These sanctioned educational theories have been used to train generations of teachers to believe that minority children suffer from a cultural deficit that requires particular pedagogies to “level the playing field” in an attempt to enculturate these students into mainstream middle-American values and norms of behavior. Teachers have been taught to expect certain

levels of inadequacy from minority students and have been provided with a mandate to make the “Other” more like themselves by purging these students of their cultural identities in order to provide them with the cultural skills they were lacking. This climate has also served to affirm teachers’ beliefs that students were indeed “different” from themselves, making minority youth legitimate “Others” with respect to their educational experience and interactions with teachers and the school.

1.4.5 Culture of Power

In the 1980s and 1990s, the cultural deficit model was replaced with a more politically correct reiteration of the same idea in which White teachers were encouraged to consider the cultural “differences” of minority students rather than their deficiencies. Using cultural difference as a new explanation for school failure, researchers maintained that children from a minority cultural background being taught by those from the dominant culture “suffer enough miscommunication and alienation to give up on school, despite the fact that they are, at least potentially, fully capable” (McDermott & Varenne, 1995, p. 335). While this new approach was helpful in that researchers, policy makers, and teachers were no longer being encouraged to view minority students as being deprived in terms of language, culture, cognitive development, and supportive familial relations, the fact remains that minority students struggle in schools and continue to fail based on these differences while “subtly imputing blame to these students by suggesting that they need to make cultural adjustments” (Toussaint, 1997, p. 67).

Delpit (1995) recognizes that while this approach “can be justifiably interpreted as racism” it is a “view that is not limited to [W]hite adults” (p. xiv). She continues to explain that racial minorities from the middle class who do not identify with poor minorities may, like White people, be “totally unable to perceive those different from themselves except through their own culturally clouded vision” (p. xiv) – a belief that frames her argument that a culture of power exists in schools, which acts as a deterministic force in relationship to minority achievement. Delpit asserts “power plays a critical role in our society and in our educational system. The worldviews of those with privileged positions are taken as the only reality, while the worldviews of those less powerful are dismissed as inconsequential” (1995, p. xv). Furthermore, Delpit (1995) argues that there are “rules for participating” in this culture of power

where these rules are a reflection of the culture of those who have power, specifically that of White middle-class America. These rules refer to ways of talking, writing, dressing, and interacting, the acquisition of which are necessary to be successful in the schools and workplaces where this culture of power is the norm (Delpit, 1995).

1.4.6 Cultural Incongruence

A lack of understanding of these rules by minority students and their teachers (who are representatives of this culture of power both consciously and unconsciously) can lead to cultural miscommunications and incongruencies between students and teachers that serve to socially polarize the two over time. Toussaint (1997) reports that many researchers studying inner-city urban high schools have found that “teachers (especially middle-class [W]hite teachers) lack a cultural understanding of the styles of self-representation of young urban [B]lack males” (p. 369) and he continues “I would hasten to add that the ‘misinterpreting’ and ‘overreacting’ to Black male students’ cultural styles is not confined to [W]hite teachers” (p. 369). This lack of cultural fit between teachers and those perceived to be “Others” can lead to failed interaction rituals which Randall Collins (2004) refers to as moments of asynchrony that can develop into a lack of solidarity among classroom participants, leading to a dissolution of the learning community. Collins contends that this solidarity results from a commonly shared emotional experience that can be characterized as having positive emotional energy. A classroom filled with cultural miscues and incongruencies would not constitute such a shared emotional experience, thus resulting in asynchronous teacher-student interactions that fail to engender what Collins refers to as entrainment (2004).

The ways in which classroom interactions can result in a sense of solidarity and a collective responsibility for learning are important considerations for this dissertation as I critically examine how the cultural and historical contexts in which my students and I have experienced school and schooling and how these experiences afford our practices and interactions in the classroom. In the following sections, I first consider the impact of cultural and social factors on teacher and student practices in the historical context of urban schools and schooling in America, followed by a focused look at the urban district in which this study is situated.

1.5 THE ROLE OF CULTURAL & SOCIAL FACTORS ON PRACTICES

1.5.1 *Hegemony and Social Reproduction in the Schools*

In spite of the efforts of Civil Rights activists and policy makers over the last half-century to integrate American schools, *de facto* racial segregation still widely exists in many rural and urban areas (Kozol, 1991; Ladson-Billings, 1994). The maintenance of segregated schools is necessary to support the hegemonic educational system that ensures the social reproduction of the classes. Although hegemony can be conceptualized in various ways, for the purposes of this research, hegemony is defined as an oppressive power structure in which the domination of the oppressed is concealed and the oppressed are complicit in their oppression in that they come to believe that their marginalization in society is of their own making (Gramsci, 1971). Clarke, Hall, Jefferson, and Roberts (1976) define hegemony as a means to “ensure that in the social relations between classes, each class is continually reproduced, in its existing dominant-subordinate form” (p. 61). Given these definitions, it becomes necessary for us to critically examine the roles of schools and teachers in this process. Many researchers have suggested that the institution of education has long served as an agent of hegemony, specifically designed to perpetuate cultural and social systems by educating youth for their roles in those systems (Carnoy, 1974). Wade Boykin (1986) describes the process of “schooling” in America as a form of social domination that:

...functions to maintain this [hegemonic] structure by sorting people according to their acquisition of skills and behavioral repertoires...by processing youth for eventual assignment of stature in the adult society. This sorting often occurs along racial/cultural/class lines (p. 58).

Couched in these terms, the education of urban youth can be seen as a political and social endeavor in which students are subjected to a cycle of social reproduction from which they cannot escape. Penelope Eckert (1989) describes the inequalities in resources and practices in American schools as playing a crucial role in the reproduction of the class hierarchy where “schooling teaches children both their place in society and how to behave in that place” and where the “gradual accumulation of differential experiences in the early years of schooling leads mainstream children to believe that education will ultimately bring rewards and success, while non-mainstream children frequently come to view education as a

humiliating and fruitless pursuit” (1989, p. 7). Eckert continues to explain that “schools do not create these distinctions in a vacuum – [that] their ideology, structure, and practices reflect the society that supports and controls them” (1989, p. 8).

Ellen Brantlinger (1993) comments on the critical role of ideology and practices in structuring one’s experiences in her consideration of Pierre Bourdieu’s work on social context and cognition:

Bourdieu (1977, 1984) maintains that human thought is a form of socialized knowledge conditioned in specific habitats; thus individuals’ epistemologies reflect their cultural histories and social class origins. According to his theory, students [and teachers] do not go to school neutral – their views of school and of one another are filtered through the images, dispositions, and myths that accrue from such sources as families, peers, and the media. (p. 4)

As both students and teachers are a product of schools and society, it makes sense that they will bring their beliefs and practices that reflect their status (role or place) in society at large. When students are “cultural Others” in relation to their teachers, the beliefs and practices of these teachers may empower them to act as agents of hegemony (both consciously and unconsciously) within the educational system. Brantlinger (1993) cites many instances in which this is true, noting that “teachers expect inferior academic performance from students from low-income families and from students of color” (Cooper & Good, 1983; Fuchs, 1973; Proctor, 1984; Rosenthal & Jacobson, 1968) and that these teachers “subsequently reduce their teaching efforts for such students” (Oakes, 1985, 1988). In contrast, Brantlinger (1993) cites other studies that have demonstrated that “teachers tend to have more positive feelings about students [they] perceived as being brighter” and that they “prefer teaching those in higher academic tracks.” For these reasons and more, critical examination of hegemonic structures associated with the process of schooling, reflection of individual teacher practices, and an examination of the cultural differences between students and teacher are a necessity for confronting and altering the teacher’s role as an agent of hegemony in the educational system. In this study, I examine how my experiences as a public school teacher in the school district of Philadelphia in two very different schools impacted my beliefs and practices in the classroom.

1.5.2 *The Phil-thy Condition of Urban Schools*

According to a recent report by Research for Action (2003), the largest percentages of minorities in urban districts attend the schools with the highest poverty rates in those districts. Philadelphia is no exception. Ranked by the 2000 Census report as the nation's eighth largest school district and fifth largest city in the United States, Philadelphia's schools face a multitude of the problems consistent with those previously described. Philadelphia metropolitan area schools can be characterized by a tripartite system such as those found in other large urban districts like Chicago and New York (Seiler, 2002). These three-tiered systems (Kozol, 1991) include neighboring high-achieving suburban schools, high-achieving magnet city schools, and low-achieving neighborhood schools, thus, constituting a range of possibilities within one educational system. These schools tend to be segregated along both racial and social class lines with schools becoming predominately more Black and poor as one moves from the top-tiered suburban and high-achieving schools to the bottom-tiered inner-city and low-achieving schools. Between each tier, there exist gaps in achievement, funding, and graduation rates (Seiler, 2002), all serving as a glaring reminder of the disparities in equity in urban education.

With more than half of its 264 schools built between 1890 and 1930 (School District of Philadelphia [SDP], 2003⁴), many students served by the District of Philadelphia attend school in deteriorating buildings with inadequate supplies, staff, and financial resources to maintain them. A NCES⁵ (2003) report states that over 83% of the 205 000 Philadelphia students enrolled are minorities and that 72% of all Philadelphia school students are economically disadvantaged, making nearly three-quarters of all Philadelphia school children eligible for Free and Reduced Price Lunch (FRPL). The SDP website (2003) reports that due to the high number of low-income students in 230 schools, all the children in these schools receive both breakfast and lunch at no cost. In 2003, the Pennsylvania Department of Education website (PDE) reported a 44% mobility rate for students in the district, indicating that nearly half the district's students had withdrawn and re-entered other schools during the academic school year. The migratory pattern of many low-income students who are forced to move in

⁴ School District of Philadelphia (2003). *About Us*. Information retrieved online Septemebr 2003 on the World Wide Web: <http://www.phila.k12.pa.us/aboutus/>

⁵ National Center for Educational Statistics. (May 2003). U.S. Department of Education Overview of Public Elementary and Secondary Schools and Districts: School Year 2001–02.

and out of school boundaries due to transient housing issues results in many unexcused absences and an inability to follow a consistent curriculum⁶. In addition, as in many urban schools, the first several months of the school year are known as “leveling,” the time in which students are scheduled and re-scheduled into many different classes in an attempt to provide that student with the required credits needed for graduation. In such instances, students often miss the material covered in the required course during this time period contributing to the students’ inability to pass the class into which they are finally scheduled. It is no wonder that nearly half of all Philadelphia ninth-graders never receive a high school diploma (Fine, 1994; Seiler, & Elmesky, in press) resulting in the reproduction of their marginalized position in society. However, there are some public schools in Philadelphia that run counter to this trend. One such school is a magnet school that boasts the highest academic achievement in the state on standardized exams. This school is called Urban Magnet (pseudonym) and it is the setting for this research.

1.5.3 My Own Brood – 9-4

During my second year of teaching at Urban Magnet, I was assigned the task of becoming an advisor to an incoming freshman class, section 9-4, the fourth section of the ninth grade composed of students with last names starting with letters R-Z. At Urban Magnet, advisors become something of a second mother to their students, serving in a daily capacity as mentor and monitor of all things academic and personal. Advisors and their class sections are paired for all four years of high school, meeting each morning for 30 minutes, during extended guidance periods on Friday afternoons, and for all standardized testing sessions. In addition, advisors are responsible for organizing and chaperoning all class trips and activities. Each advisory class seems to take on its own personality through the years with a great deal of rivalry among not only other grades, but also other sections. All assembly seating is assigned by advisory in the auditorium where repetitive and rambunctious chants of year and section, “niinnee-fooouuur!” are common among students. Students have compared the camaraderie of an advisory to that of a platoon. This

⁶ As a means to counter this problem, Philadelphia schools are currently transferring to a district wide “scope and sequence” format that requires all teachers to teach the same lessons from the same books on the same day throughout the district so that when students move from one school to another, they will be able to continue their education without repeating or missing portions of the material to be covered.

experience as platoon leader allowed me, for the first time, to really get to know my students both academically and personally. As an advisor, students' social and home lives became more transparent and it was from these more intimate glimpses into their lives that I first began to recognize the impact of their middle school experiences at Urban Magnet on the development of their social and science practices as well as their achievement in all of their other classes.

1.5.4 How Can They Be Failing?

Having previously taught seventh grade in a neighborhood school, labeled as "failing" by the school district, I felt I had a clear understanding of why *those* students were not achieving. The neighborhood school was plagued with poverty, a lack of books and resources, and qualified teachers. The students, though bright, had suffered through many years of being taught by substitutes on both short-and long-term assignments because the school was not capable of attracting and retaining teachers. The students, who were several years behind their grade level in almost all subjects, were difficult to control, and for the most part, were not really vested in their educational pursuits. Many of these students were hungry at the beginning of the school day and tired, for various reasons, including from having slept in shelters overnight or on the streets with their parents. Considering all of this, it was not difficult for me to understand why high academic achievement was not occurring in this environment, or why student, teacher, and parental morale were so low.

In comparison, Urban Magnet was fully staffed in a beautifully maintained building with appropriate texts and many more available supplies for students and teachers. Urban Magnet parents, for the most part, were actively involved in their children's education, filling the rooms to capacity on Parent-Teacher Night as opposed to the three parents in attendance at my neighborhood school. So, how could it be possible to have students failing here, students in my own classes feeling that they were stupid, and being called stupid by their peers? Given that these students were all chosen based on measured ability and were supposed to represent the "cream of the crop," I wondered how so many could be made to feel they were failures and to in fact, fail? What was it about these students that contributed to their view of themselves as failures or successes, as capable or incapable? And what about the school structure itself could be fostering this attitude and allowing these students to

perform poorly without addressing these concerns and supporting these students to achieve? I began to consider what structures were affecting students' success at Urban Magnet and how my practices as a teacher could be contributing to their failures and successes.

1.6 THE ROLE OF STRUCTURE & AGENCY ON THE PRACTICES OF TEACHERS AND STUDENTS

1.6.1 Limiting Students, Limiting Potential

Cultural sociology (Sewell, 1992, 1999; Swidler, 1986) is useful for examining how the structures of the school and classroom afford the success of students with varying backgrounds and experiences to identify and develop strategies that enable them to be successful in the classroom. Additionally, this framework provides an effective means to examine how an individual student's cultural, social, and symbolic capital (Bourdieu, 1986, 1992; Sewell, 1992, 1999) affords his or her practices in the classroom. Using a sociocultural lens, the classroom can be viewed as a loosely bound field (Sewell, 1999) in which associated culture is enacted (Seiler, 2002). This culture can be viewed as the interconnection of science knowledge, rules, dispositions, and associated practices serving to constitute the field of the science classroom (Swidler, 1986). Within this field, culture is enacted both consciously and unconsciously and can be described as cultural practices (Sewell, 1992), dispositions (Boykin, 1986), strategies of action (Swidler, 1986), or tools in a toolkit (Swidler, 1986). While each of these theories will be interwoven throughout the dissertation, Sewell's work will dominate the discussion.

1.6.2 Structures and Fields

Practices enacted in fields (Sewell, 1999) such as the chemistry classroom, whose boundaries tend to be both weak and porous, allow cultures from other fields such as the home or the street to also be enacted within the classroom (Elmesky, 2001; Seiler, Tobin, & Sokolic, 2001; Sewell, 1999). Gale Seiler (2002) describes fields as being nested within one another. In this model, the field of the classroom is nested or situated within the field of the school, which is situated within the larger field of the neighborhood, etc., and each of these fields has associated with it different structures comprised of schema and practices. Structure here includes both physical factors, including material, human, and symbolic resources as well as ideological factors,

such as the values and beliefs of the individual and community that are all connected to cultural practices. These structural factors are intimately connected, as it is the beliefs and values (schema) that one holds that shapes how resources (material, human, and symbolic) are understood and ultimately used.

Culture, then, can be described as schema dialectically connected to practices that get engaged when an individual uses resources from any particular field for the purpose of affording their goals (Tobin, in press). For example, in the classroom, the beliefs a teacher holds about her students will frame what resources she will employ in their curriculum instruction. So while a teacher may have access to lab equipment, her belief that her students are incapable of handling these materials safely may prevent her from allowing students access to these material resources. Because the teacher may still have the goal of *teaching* science, she may choose to rely more heavily on textbooks, worksheets, and demos for instruction. And so, the teacher's schema, (beliefs or expectations for her students) is influential in structuring the physical factors (resources) in the field of the classroom. Therefore the structure of the field affords the agency, or power to act, of both teachers and students within the field.

Structure, like schema and practices, also exists in a dialectical relationship with agency. Given the dual nature of structure and agency, an individual's agency can be understood as that which is simultaneously being structured by the field while serving as a structuring agent of that field. So as individuals act within the field, they experience the structure in the form of schema while simultaneously contributing to the structure via their practices that are afforded by the field. The structure associated with different fields can elicit different cultural practices in each field. This can be a source of contradiction, especially when fields are nested within one another. For example, the culture associated with the hallways of a school between classes is generally different than the culture associated with the science classroom in that same school.

Because agency is regarded as being dialectically interconnected with structure, the structure of a field makes a difference in what culture is considered mainstream or central. In this way, structure is important in shaping what cultural practices are afforded, but structure does not determine cultural practice. For this reason, it is

important to examine how structures associated with the school afford teacher agency and success as well as how structures associated with the classroom afford student agency and success (Tobin, in press). With these concerns in mind, I began to critically examine the influence of structure along with historical and social context in the teaching and learning of science in my own classroom, thus providing the purpose and focus of this study.

1.6.3 Purpose and Focus of the Study:

The existing body of literature available to help educators understand the diverse lifeworlds of students and effective teaching strategies that aid in their learning is extremely lacking. Specifically there is a dearth of research on the effective teaching of female, minority, and low socioeconomic student populations. In addition, studies performed in the past have often looked at *unsuccessful* urban schools in order to understand how to improve student achievement and teacher instruction, as well as how to incorporate the lifeworlds of the students into the curriculum. This study is unique in that it offers a different perspective by examining the influence of structure and the social and historical contexts of lived experiences on teacher and student practices and achievement in the context of the science learning that takes place in a high achieving urban magnet high school.

Conducted within the methodological framework of critical ethnography, this research provides evidence of the ways in which capital shapes and is shaped by the practices and beliefs of students and teachers in different fields and how those, in turn, structure the fields and afford agency for both the individual and collective. This necessitates that I develop the social and cultural contexts in which both my students and I live our lives in an effort to explore our cultural enactment in relation to science and in our lifeworlds outside of the school. By using sociocultural theory, this research examines the practices that afford teacher and student agency in urban schools and attempts to 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.

1.6.4 Overarching Questions

The following questions guide my research:

1. How do practices and schemas gained by being within school structures afford the structures of the classroom field?
2. How can the structures of the classroom be transformed to allow students and teachers greater exchange of capital (social, cultural, and symbolic)?
3. How does the exchange of capital afford agency for the participants?
4. How can participant's actions transform the structures associated with school and the classroom to break cycles of reproduction?

1.7 CONTEXT OF THE STUDY

1.7.1 The Chemistry Classroom

The setting of this on-going study takes place in my tenth grade chemistry classroom in an urban magnet high school, known as Urban Magnet. With the exception of language and electives, all students at Urban Magnet are required to take the same content area courses in the same sequence, starting with Biology in ninth grade, followed by Chemistry in tenth, Physics in eleventh, and an AP science elective in their senior year. Therefore, all students are required to take the same year-long, mathematics based, traditional chemistry course during their tenth grade year. The goals of the course are to prepare students for the mathematical challenges found on the SAT II for chemistry and to prepare them for the possibility of taking the AP Chemistry course offered their senior year. Students are required to have a basic knowledge of standard chemistry principles and scientific practices as well as a solid understanding of and ability to use algebra for this course. For these reasons, this course often poses a great challenge for those students who were inadequately prepared by their experiences in previous math and science courses and for those who lack access to necessary resources, such as calculators, Internet access, and computers.

1.7.2 The Student Population

The class met once a day for approximately 50-minute periods with a double period once a week for lab. The class consisted of 26 students, 10 boys and 16 girls. On a self-reported survey, the students identified themselves as 23% African American or Black⁷, 54% Caucasian or White, 3% Hispanic, 8% Asian, and 12% of mixed racial backgrounds. Of these students, 23% are bilingual or non-native English speakers,

⁷ The survey allowed students to choose identify himself or herself as Black or African American or to write-in any other preference.

three of whom arrived in the United States in the past four years. Eight percent of the students reported they were from a poor/low socioeconomic background, 26% from lower-middle class status, 42% from middle class status, 15% from upper middle class status and 9% declined to answer⁸. These students represent a range of racial, ethnic, cultural, and socioeconomic backgrounds and are drawn from different regions all over the city.

1.7.3 The Research Setting

This study is a critical ethnography of the teaching and learning in my class, employing mesoanalysis and microanalysis of video recordings of my teaching and multiple qualitative data sources. Microanalysis provides a means by which to make claims at the meso-level. Even though this is primarily a meso-level study, micro-level analysis is used to search for consistency and contradictions of patterns identified at the meso-level. In addition to a microscopic examination of teacher and student practices in the classroom, a significant feature of the design involves students as researchers. Student attitudes about science and learning are chronicled through student written electronic journals about class, interviews with other students, and student-taped and-edited video ethnographies of their lives as students and learners of science. Using cogenerative dialogues (LaVan, 2004; LaVan & Beers, in press; Roth & Tobin, 2001; Wassel, 2004), participants discuss the nature of science (e.g., what gets valued, the roles people play, the rules, and what it means to do science), whereby students and teachers are encouraged to voice their opinions and concerns in a collective activity that supports the development of the learning community.

1.8 OVERVIEW OF THE DISSERTATION

1.8.1 Chapter One

In the first chapter, I begin with a discussion of the state of urban education in which the failure of students, teachers, and schools is presented as a function of the greater hegemonic structures associated with the cultural differences between those of different socioeconomic status and race, whereby a socially stratified society is reproduced and maintained. This issue is situated within relevant literature that depicts the many difficulties facing urban schools and the teachers and students who

⁸ Students were given the option to decline to provide this information.

attend them. I briefly introduce and interweave the theoretical underpinnings of the study, specifically illustrating the importance of cultural sociology as a lens to examine the ways in which the culture and practices of both students and teachers structure a learning environment. Finally, I delineate the purpose and context of the study as well as pose the research questions that serve as impetus for this research.

1.8.2 Chapter Two

The second chapter describes the methodological framework for the study. This study is conducted as a critical ethnography (Barton, 2001; Lather, 1986) in which both macro, meso, and micro perspectives are utilized in the analysis of multiple data resources, and the criteria employed to ensure the quality of this investigation are disclosed. For the purposes of this study, I focus on meso-level analysis with supporting vignettes using micro-level analysis to make claims about patterns seen at the meso-level. In addition, I describe the use of autobiography and personal narrative in an attempt to provide a greater context in which to examine the practices and schema of participants in the study.

1.8.3 Chapter Three

Chapter 3 is an autobiographical account of my past educational experiences, recounted in an attempt to demonstrate their relative impact upon my experiences as a teacher and a learner. This chapter is socially and culturally grounded in life history, which enables me to recognize the role of social reproductive cycles in my own life and in the lives of my students. This chapter examines the ways in which structural changes shaped my teaching practices allowing for the building of a more cohesive learning community that benefited both my students and me.

1.8.4 Chapter Four

Chapter 4 provides the background for the study by describing larger structures of the school that influence the teaching and learning practices in the classroom. This chapter provides a descriptive overview of the cultural and historical context of Urban Magnet by examining how the larger school culture shapes the practices and beliefs of participants in the school. To reveal ways in which school structures can both support and contradict the goal of academic excellence for all at Urban Magnet, this chapter specifically focuses on student and teacher selection, admission to the school, and teacher and student access to and appropriation of resources. Explored at

the macro- and meso-level, this description presents both contradictory and coherent aspects of the school culture that shape student and teacher practices in the classroom.

1.8.5 Chapter Five

Chapter 5 employs the frameworks of cultural sociology (Bourdieu, 1986, 1992; Sewell, 1992; 1999) and the sociology of emotions (Collins, 2004) to more specifically explore my evolving understanding of what it means to do science in connection with my teaching practices and my role in student/teacher interactions. I examine these issues by evaluating the structures of the classroom, including the schema, practices, and dispositions initially enacted, and how those structures resonated with students to either afford or impede the enactment of science learning. This chapter makes clear the need for transforming the ways in which my students and I interacted with one another in science and introduces cogenerative dialogues as a tool for catalyzing changes. In this chapter, I employ micro-level video and audio analysis to deconstruct and analyze the classroom as it was before, during and after my introduction to cogenerative dialogues. Specifically, this chapter provides a snapshot of my teaching prior to my involvement in various fields (including the MCE program and Discovering Urban Science) in an effort to explore my pre-existing schema and practices regarding science and science teaching before they were challenged by my participation in this research.

1.8.6 Chapter six

In this chapter, I expand upon the nature of cogenerative dialogues (as introduced in chapter 2) by detailing how they came to be used, when and how they were employed, who was involved, and some of the topics discussed in these conversations. This arrangement enables me to examine how practices and schemas (Sewell, 1992) developed in the field of cogenerative dialogue informed the structures of the science classroom and ultimately allowed participants to develop structures that served to facilitate teaching and learning of chemistry. In addition, this chapter explores how cogenerative dialogues occurring in multiple overlapping fields with numerous participants, served as a resource for my students and me as we began examining the way we enacted culture in our classroom and how this enactment afforded and/or truncated our agency. Chapter 6 reveals through both

micro-and meso-level analysis of video interactions the ways in which the classroom structures changed to provide students with greater opportunities for success in our chemistry class. This chapter also discusses the contradictions that persisted in the classroom structure and new contradictions that arose in relation to the changes we made. Specifically, this chapter examines how my changing understanding of what it means to learn and do science affected the ways in which I assessed student understanding and how these changes in the classroom structure afforded student achievement.

1.8.7 Chapter seven

This chapter examines several themes that spiraled through our conversations about how best to re-structure our learning environment to afford greater student and teacher agency. Student assessment, use of peer groups, and the role of questioning were all addressed in multiple fields of cogenerative dialogue. I highlight the transformation of my assessment practices and the experiences of different students to demonstrate how the structures of our classroom evolved over the course of the research. I draw on both micro- and meso-level findings to illustrate how these changing structures enabled some students to build positive emotional energy with science and solidarity with both me and their peers which afforded some students greater agency in the classroom. I examine the ways in which the transformations in classroom structures were recursively tied to the multiple overlapping fields of cogenerative dialogues held with different participants in the classroom, paying particular attention to contradictions that emerged as structures changed.

1.8.8 Chapter eight

In this mini-chapter, I highlight some of the difficulties that my students and I faced during the last quarter of the school year when we temporarily moved away from cogenerative dialogues. This chapter provides a brief epilogue of the structural changes that took place in our classroom in the last three months of the school year due to new measures imposed by the school district in response to new state and federal testing mandates. The chapter concludes with an examination of some of the questions that emerged as my students and I ended our year of classroom research and began to reflect critically on how our experiences would affect our beliefs and practices as we moved into a new school year.

1.8.9 Chapter nine

In the concluding chapter, I re-examine the findings of this study in conjunction with the questions posed in the beginning of the dissertation and in the broader context of the current state of education. Using cultural sociology, autobiographical reflection, and the sociology of emotions, I present a case for cogenerative dialogue as a pathway for transforming science teaching and learning. Finally, I examine the authenticity of the study and I offer implications that these findings raise for teacher education programs and for reforming education policies at the state and national levels.

1.9 CONCLUSIONS

Through this research, I examine ways in which certain structures afford student and teacher agency and how capital exchanges in different fields shape practices in urban science teaching and learning. In addition, I explore the importance in developing not just the strategies that build scientific dispositions for success in my classroom, but also the need to provide “non-traditional” students with tools, resources, and strategies for negotiating other structures to afford student agency outside of my classroom.

CHAPTER 2

METHODOLOGICAL CONSIDERATIONS

I am a scientist – I seek to understand me.

I am an incurable & nothing else behaves like me.

(R.Pollack, lyrics from “I am a scientist”, 1994).

2.1 INTRODUCTION

As a science teacher, I have taught many students who have experienced little success in their science or math classes. Often these students feel defeated before my course even begins, saying, “I’m no good in science.” or “Science isn’t for me.” When pressed to explain why they feel this way, students mostly shrug their shoulders indicating they do not know *why*, just that they *do*. When I first started talking to my students about their academic histories, I was struck by the number of students, mostly of color and from low socioeconomic class, who reported having had very few experiences with science in their elementary schools. It was not until middle school that most of these students had their first class devoted exclusively to science. Whether or not my students regarded their experiences with science as positive or not seemed to be largely dependent upon their emotional and social experiences with their teachers and their classmates.

This finding was very significant to me. I started to take notice of how my colleagues interacted with various students in their classes and in the hallways and wondered how these social relationships shaped student achievement in their classrooms. I began to think more about my interactions with students in my own classes and what influence these interactions may have on student participation and achievement. I also began to think about my own experiences with science in school and how my own feelings of success and achievement were connected to my interactions with my teachers and peers. I thought about the times I had felt unsuccessful in school and wondered what it was about those interactions that made me feel isolated from science and learning. As I pondered my own difficulties, it occurred to me that cultural differences often played a prominent role in preventing me from reaching my goals in the classroom. These considerations provided the impetus for my

involvement as a teacher researcher within the context of a larger ethnographic study of science teaching and learning in a variety of classrooms in different schools across the city.

In the following sections, I situate my involvement within the research and the context of the study as it evolved in my chemistry classroom during the 2001-2002 school year. In addition, I lay out the methodological framework that I use in my research and I explain how I combine aspects of critical ethnography, autobiography, and personal narrative in creating an approach to research that is both meaningful to me and transformative in my life and the lives of my students. Finally, I describe the actual research in more detail and make clear the connections between the methodology and the theory employed to frame my interpretation of the study.

2.2 DISCOVERING URBAN SCIENCE (DUS)

2.2.1 An Urban Focus

Historically, educational research has focused on issues faced by middle-and upper-middle-class students in suburban schools. These findings are often then applied to urban schools in an effort to address the problems facing urban educators today. Until recently, there have been few studies focused on urban education and even fewer studies focusing on science education in urban settings. Discovering Urban Science (DUS), a NSF⁹ funded research project, provided an excellent opportunity for me to examine my own classroom and the challenges that I, as an urban educator, faced on a daily basis.

DUS employed critical ethnography to investigate ways of improving science instruction in five urban high schools serving predominantly low-income students in the school district of Philadelphia. Within each school setting, teachers were identified to participate in the DUS study in an attempt to better understand the problems facing teachers in these urban science classrooms. As a participant, I worked as a teacher researcher along side a university researcher and four student researchers to help collect and analyze data from the classroom and to lend multiple perspectives and voices to the study. The study focused on three comprehensive neighborhood schools, a charter school, and a magnet school. I was invited, along

⁹ The National Science Foundation under grant number: REC- 0107022 supports the research in this paper.

with my friend and fellow physics teacher Linda Loman, to specifically investigate teaching and learning in an urban magnet school.

2.3 SITUATING THE STUDY

When invited to join a study researching the teaching and learning of science in urban classrooms, I joined in hopes that I could discover why so many of my students felt so isolated from science, their teachers, and the school. I was particularly interested in being part of a study that involved other science teachers in the city because it provided me with an opportunity to learn more about their experiences and to learn how other urban teachers were dealing with issues around student achievement and student-teacher interactions. I was eager to listen to these teachers describe their classrooms and their students and I longed to belong to a community that encouraged reflection on my daily practices and that offered support and advice about how to make changes in my classroom that would benefit my teaching and student learning. Never could I have imagined how life-altering my decision to join the DUS project as a teacher researcher would be for my students and me.

2.3.1 *A Transition: Researcher – Not Researched*

Although I was wary about inviting outsiders into my classroom, I was optimistic that this research would be different because the focus was on improving *my* practices in *my* classroom. My involvement promised immediate, tangible benefits for my participation rather than an acknowledgement in a paper published in a teaching journal that I might have never been given an opportunity to read. And while, my participation in DUS has been very empowering and I feel that my contributions to the research, both in focus and analysis, have been substantial, this was not always the case. In the beginning, I was skeptical about my participation as a co-researcher in the project and my past negative experiences with educational research left me feeling much more like someone being observed and “researched” than someone who would identify herself as a *researcher*.

2.3.2 *Research Meetings and Seminar*

The one constant in the initial stages of my involvement with the research was our weekly seminar meetings which included all of the university researchers and teacher researchers from each site as well as Dr. Kenneth Tobin, the Principal Investigator

and organizer of the entire DUS project. These meetings provided me with an interactive forum in which I could not only pose my own questions about the direction of the research project, but where I heard other teacher researchers and university researchers voice their concerns about the research process, expectations for involvement, and suggested changes to our current research model.

In addition, seminar lectures (focusing on initial findings from each site) presented by university researchers and Dr. Tobin greatly enhanced my understanding of the research methodology we were employing in the study and sociocultural theory that we were using to analyze the data we were collecting. Seminar was crucial in bridging the gap between research and theory and in helping me develop a more positive view of educational research and its benefits for classroom teachers. Finally, and perhaps most importantly, it provided a space that allowed me to build (and continually reinforce) personal relationships with all of the university and teacher researchers involved in the study. The communality experienced at seminar helped foster a sense of trust and mutual respect between me and other DUS participants. It was not until this trust and respect was firmly established that I was able to critically examine my teaching practices in the presence of others without feeling self-conscious or exploited.

2.3.3 The Evolving Nature of Research

Another critical component to my involvement in seminar was that it provided me with an opportunity to critically examine our research methodology with others. Participants were not only encouraged, but were expected to suggest changes that would improve the study, thus reminding us of the evolving nature of our research. This flexibility allowed us the freedom to identify contradictions within the study and the space to voice our concerns with the direction of the research, including our need to examine the efficacy of our research teams at Urban Magnet. Stacy Olitsky, the university researcher assigned to Urban Magnet was also a rookie who had not done education research before she found herself collaborating with Linda and me. In hindsight, we all had a great deal to learn about doing collaborative classroom research. Fortunately, the design of our research encouraged us to discuss ways to maximize our productivity. As a result, we decided to have Stacey concentrate on her

research with Linda and to introduce a second doctoral student, Sarah-Kate LaVan, as a new university researcher in my classroom.

This decision allowed the full potential of our collaborative research to emerge as this change proved to be beneficial for all of our growing research interests. In addition, this change clearly marked a significant evolution in my development from feeling researched to becoming a researcher. The sense of empowerment that I felt from being an active participant in catalyzing this change bolstered my confidence in the goals of the research project, goals that had been largely developed in the absence of my input or any of the other teacher researchers when first submitted for funding. And while many teachers often feel divorced from the decision-making processes that, at all levels of administration (federal, state, district, and school), determine what curricular and instructional practices must be implemented within their classrooms, giving teachers little or no opportunities to voice their concerns, this was untrue of my involvement with DUS. The research methodology was specifically designed with these issues in mind, leaving space for teacher researchers, university researchers, and student researchers to develop their own interests and to follow their own emerging research questions. In the following sections, I further explore the methodological framework used in my research that allowed me to create an approach to research that was both meaningful and transformative in the teaching and learning of science in my classroom.

2.4 RESEARCH AS PRAXIS

2.4.1 Critical Ethnography as a Methodological Framework

Critical ethnography is a methodology for conducting research focused on participatory critique, transformation, empowerment, and social justice... (Pizarro, 1998). It is important therefore to realize that critical ethnography is grounded in a social-constructivist epistemological framework in which knowledge generation within research is understood as an active, context-based process influenced by the values, histories, and practices of the researcher and the community in which the research is done (Atwater, 1996).

Cited from Angela Barton's (p. 905, 2001) research, critical ethnography not only provides a methodological framework for the organization and analysis of practices and social interactions as expressed and experienced in urban schools, but it also necessitates an approach requiring researchers to critically examine these interactions

and their interpretations of these interactions in light of the historical and social contexts in which they occur. Barton (2001) continues, stating that critical ethnography is intrinsically political and that both education and research are “steeped in cultural beliefs and values,” thus confirming Lather’s (1986) position that there is no such thing as a neutral education or neutral educational research. For these reasons, critical ethnography demands the research be catalytic in that it should alter practices and social interactions that serve to maintain oppressive cycles of social reproduction. By working to adopt new “co-constructed” structures that afford greater agency for both teachers and students, the catalytic nature of this research has the potential to transform science in urban settings by explicitly addressing the oppressive and hegemonic structures under which both teachers and students labor.

The methods employed in this ethnography are designed to catalyze social transformation by identifying contradictions within structures and then finding ways to alter these structures to afford the agency of all those involved. The substitution of Sarah-Kate for Stacey in the role of university researcher in my classroom is an example of how the identification of a contradiction in the structure (where Stacey was unable to successfully engage in an intensive capacity in two classrooms with two teacher-researchers) can result in greater agency for me, Stacey, and the students in the study. In this case, Stacey was better able to focus her attention and energy on Linda’s classroom, and I was matched with a new researcher who could offer the same level of engagement in my classroom. Structural changes in the organization of the research teams resulted in more stable and productive research relationships between not only university researchers and teachers, but also between university researchers and student researchers as this structural change provided a better division of labor, allowing more time and opportunity for Stacey and Sarah-Kate to interact with students. The identification of contradictions in structures serves an important role in the catalytic nature of critical ethnography as the contradictions serve as potential sites for change. This need for a structural change in the formation of the research teams emerged as our early involvement in the research process evolved, thus the design of our study allows our experiences to inform our practices and affect change in structures to further improve our research practices. In the following sections, I explore the recursive nature of our research in greater detail by

highlighting the benefits of framing the study within a collaborative, highly flexible and emergent research design.

2.4.2 Critical Ethnography: The Recursive Nature of Research

Critical ethnography can be described as “research as praxis” which involves a “dialectical theory- and practice-building process” where “practice and research shape each other in an endless cycle” (Barton, 2001). A research as praxis model encourages participants to make connections between theory and practice in their everyday lives. This recursive relationship between practice, theory, and research provides a means for local transformation of structures and practices as findings from the research/theory continually inform the practices of participants and vice versa. This form of research practice is also “authentic” in a catalytic sense in that our evolving understandings directly inform and transform our praxis. That research participants “become increasingly critically conscious of their situations in the world and the impact this has on relationships and knowledge construction” (Barton, 2001) speaks to this development in our own research.

For this reason, critical ethnography is essential for change as it is “rooted in the belief that exposing, critiquing, and transforming inequalities associated with social structures” are both “consequential and fundamental dimensions” (Barton, 2001) of the research. Exposing hegemonic structures as identified from multiple perspectives by seeking to address limitations and to transform issues of inequality to afford the agency of all participants is an essential element of this research. This research is critical in that its primary goal is to counter the potential forces of oppression as experienced by students and teachers in (science) education and educational research that serve to (produce) reproduce social injustices. The sense of “critical awareness” removes determinism and reproduction of position in a social space by allowing agency (of both students and teachers) to be directed with a clearer understanding of the obstacles preventing access and/or appropriation of the resources needed to meet their goals. For this reason, collaborative research is seen as instrumental in identifying both “sites and strategies by which transformation can be accomplished” (Kincheloe, 1998).

2.4.3 A Participatory Pedagogy: The Nature of Collaborative Research

Traditional ethnography relies heavily on thick description of culture and social interactions in an attempt to construct understanding, but such accounts rarely include the “subjects” of study in the research process itself. In addition, these studies are limited by their inability to involve participants in the analysis and interpretation of the events in their lives, resulting in what Guba and Lincoln (1989) refer to as interpretations of events as “created realities” that lack a holistic description of and interpretation of the lives and experiences of the subjects in these ethnographies. Critical ethnography differs from this interpretive approach by generating understandings of shared events in conjunction with all stakeholders by including both of the voices and interpretations of all those involved. This collaborative approach is powerful as a transformative force both in the lives of those studied and in educational research because it necessitates a different participatory role for those being researched. Barton (2001) refers to this research methodology as participatory pedagogy, stating that “research must be a fully reflexive process” in that the research process becomes “research with rather than research on or even for.” This notion mandates a true participatory role for both my students and me; one in which our voices serve to not only generate data for analysis, but that also incorporates our interpretation of the events and our interactions from our own perspective.

2.5 EXAMINING THE INTERPRETIVE LENS

Interpretation requires that researchers consider issues of individual perception of the events and interactions described in a study, all of which are informed by the historical, social, and cultural contexts in which people live their lives. For this reason, it is imperative that I examine the life experiences of both my students and me in an attempt to understand the nature of our relationships with one another, science, and school. An appreciation of how experiences contribute to the development of individual ideological beliefs and practices is crucial for understanding the differing ways in which structures afford or truncate the agency of different individuals. Autobiography and personal narrative offers a critical method that allows me to consider the differing interpretive lens of the same events by multiple participants, thus, lending a more layered and holistic view of classroom interactions.

2.5.1 *Focusing the Interpretive lens: Autobiography as Auto-ethnography*

Autobiography and personal narrative are powerful ethnographic tools in that they provide a critical means of evaluating an individual's personal construction of "knowing" as well as an "understanding of this knowing" (Roth, 2000). Because schema and practices are both socially and historically constituted, it is imperative that ethnographers (and their audience) consider the ways in which lived experience informs their interpretations of events. Autobiography provides a means for the ethnographer to consider the lens through which she views "Others" while simultaneously providing the reader with a lens from which to consider the way the ethnographer *represents* this "Other." In the following quote, Wolff-Michael Roth (2000) explores the importance of autobiography in establishing perspective in ethnographic research and the representation of "others" in relation to one's self.

The stories ethnographers create are as much a reflection of their own cultural positioning as they are descriptions of positioning of others. Making these historically constituted positions clear to the reader, that is, writing autobiography is one way of understanding and incorporating our prejudices into our practices and into what we produce. Making sense of our representations of some Other involves our own positioning in relation to what we are seeing as much as any meaning inherent in the images themselves. ...(p. 7).

In this sense, autobiography is not seen as a mere recounting of one's life, but a critical examination of one's "lived experience" along side a "structural analysis" of these experiences in an attempt to "establish and stabilize inter-subjectivity" (Roth, 2000). My use of personal narrative in this ethnography allows me to call attention to the ways in which my identity and experiences have influenced the research process (Lee, 1996), along with my interpretation *of* and interactions *with* others. It is important to recognize that what I choose to pay attention to, what I choose to overlook, and how I interpret that which I find salient is largely dependent on my past experiences and that only through the explicit inclusion of my voice and story can the reader also be made aware of the lens that informs my perspective.

2.5.2 *Through the Looking Glass*

Just as I must consider the lens through which I view my interactions with my students, I must also be cognizant of the historical and cultural lens through which my students view me as their "responses to me and perceptions of me are influenced

by their own social identities” and experiences (Lee, 1996). Involving students as researchers has been crucial in providing this perspective to the study; with student-created video ethnographies, journal entries, student-designed and -transcribed interviews, and presentations at professional conferences serving as some the more significant contributions. Student participation as true “co-researchers” has been key to the development of our understanding of the ways in which students experience school and schooling. In addition, student-created video ethnographies of their home lives and social spaces outside of the classroom have provided students with an opportunity to represent their voice and to introduce me (and other students and researchers) to the larger context in which these students live their lives.

My involvement with students as researchers provided me with a window into their lives, encouraging them to share with me their personal experiences, opening a door that was closed to me as a “traditional teacher.” These experiences forever altered the way I viewed my interactions with my students. The critical nature of our research urged me to examine and confront my role as “teacher” in structuring a learning environment that was sometimes unfair and oppressive to certain students while simultaneously providing a supportive network of co-researchers (students, teachers, and university researchers) all collectively working to responsively and responsibly alter oppressive structures to afford greater student and teacher agency; thus, directly speaking to the quality of design of the overall evaluation process as detailed in the following sections.

2.6 THE QUALITY AND NATURE OF RESPONSIVE EVALUATION

Far from viewing cultural and political elements as hazards that impede evaluation effort, fourth generation evaluation recognizes that all human activity – including all forms of inquiry – is bounded and framed by elements of culture and politics. Rather than attempting to circumscribe or negate such elements ... constructivist evaluation treats social, cultural, and political features as elementary properties of human circumstance and incorporates them into the inquiry process (Guba and Lincoln, 1989, p. 253).

Fourth generation evaluation as described by Egon Guba and Yvonna Lincoln (1989) “seeks out different stakeholder views” for the purpose of introducing “concerns and issues” as raised by these stakeholders in an attempt to “negotiate” these issues “in an effort to reach consensus on the disputed items” (p. 42). The evolving nature of our research is grounded in and complemented by the tenets of this evaluation

process in that critical ethnography is also “bounded and framed by elements of culture and politics” and as such, must take into account the perspectives of all members of the study in an attempt to reveal and resolve ideologies and practices that serve to disenfranchise and sustain a hegemonic system of social oppression.

Relying heavily on value-based research, both critical ethnography and fourth generation evaluation stand in stark contrast to more traditional, positivist and interpretive methods of research. For this reason, traditional definitions of validity and objectivity cannot be attributed to these methods, requiring new measures of research quality and authenticity. Guba and Lincoln (1989) describe a set of trustworthy and authenticity criteria “embedded in the basic belief of constructivism” that serve as measures by which we can judge the validity and quality of our study. These constructs have been essential for guiding and monitoring the evolution of our research methodology. The criteria of credibility, dependability and transferability are embedded within our research approach.

2.6.1 Credibility

Credibility speaks to the analytical depth and scope of my study as made possible by prolonged engagement with and persistent observations of participants in the study. This study is longitudinal since I had, in both their eighth and ninth grade years, taught many of the students who participated in the research in this tenth-grade chemistry class and I have maintained my relationship with them into their last year of high school. Additionally, I have maintained very close contact with Sarah-Kate and the other teacher and university researchers involved in the DUS project through collaboration on various projects, courses, and our weekly seminar meetings. This involvement enables me to “overcome the effects of misinformation, distortion, or presented ‘fronts’ to establish the rapport and build the trust necessary to uncover constructions, and to facilitate immersing oneself in and understanding the context’s culture” (Guba & Lincoln, 1989, p. 237).

Credibility is also established via peer debriefing and member checking. Peer debriefing occurs both within the DUS project among various participants and outside of the project with other teachers, parents, students and educational researchers not involved with DUS. Member checking is of particular significance to this study because it provides multiple perspectives from those involved in the study.

Traditionally, comparative interpretation within the constructs of member checking would serve to either confirm or deny claims or assertions by researchers. In this study, member checking served as a much more crucial technique for establishing credibility by “establishing the multiple realities” of differing stakeholders and by “verifying those multiple constructions with those who provided them” (Guba & Lincoln, 1989, p. 239). Cogenerative dialogue (LaVan, 2004; LaVan & Beers, in press; Roth & Tobin, 2002; Wassel, 2004) provided a powerful forum for this member checking process in which the interpretations of multiple stakeholders were continuously co-constructed and revised. This venue served to verify “the constructions collected” as “offered” by those in the study and provided a space in which we could all consider our changing constructions of classroom and the emergence of new concerns that dictated new directions for inquiry.

2.6.2 Dependability

Guba and Lincoln (1989) assert that “methodological changes and shifts in constructions are expected products of an emergent design” and are the “hallmarks of a maturing and successful inquiry” (p. 242). Conventional inquiry would resist changes in methodological design for fear that such changes would affect the reliability of the study. That our research is recursively informed by our findings in order to address and transform structurally oppressive ideologies and practices requires flexibility in our research design. However, such “changes and shifts need to be both tracked and trackable (publicly inspectable)” so that others may “explore the process, judge decisions that were made, and understand salient factors” (p. 242) that led to those decisions. A process of documenting methodological and analytical shifts accomplishes dependability in the research.

2.6.3 Transferability

Finally, transferability is recognized as how applicable the findings of this study in this context are to other settings with either similar or dissimilar conditions – that is to what degree are these findings generalizable. Guba and Lincoln (1989) note that this ability to generalize or transfer findings to another situation is relative, depending “entirely on the degree to which salient conditions overlap or match.” Further, they suggest that the most effective way to establish any degree of transferability is via “thick description” including “extensive and careful descriptions

of the time, the place, the context, [and] the culture” (p. 241), arguing that thick description can facilitate “transferability judgments on the part of others who may wish to apply the study to their own situation” (p. 242). The very nature of critical ethnography necessitates these rich descriptions, providing sufficient support for transferability.

2.6.4 Authenticity Criteria

Guba and Lincoln (1989) agree that the above criteria can be characterized as methods for conducting research that “are not entirely satisfactory” because they suggest a “method” by which inquiry is conducted. And while this method is viewed as “critical for ensuring that results are trustworthy,” it raises questions about “whether stakeholder rights...are in fact honored” (p. 245). To counter this concern, Guba and Lincoln (1989) posit ontological, educative, catalytic, and tactical criteria to ensure authenticity. That our research is collaborative in nature lends to the authenticity of the study in that multiple voices and perspectives inform and alter the direction of the research, providing another layer of complexity in the development of this research/theory/practice model of investigation. The heart of our research revolves around the intent that all stakeholders “expand their individual constructions of the world” (ontological) (p. 248) while engaging in activities and relationships with other stakeholders that offer a chance to “comprehend and appreciate” the constructs of “others different from themselves” (educative) (p. 249). Because this research is primarily concerned with social transformation and the affordance of agency for all stakeholders, methods that “stimulate action” and change (catalytic) (p. 249) underpin all aspects of data collection, analysis, and our interpretation of data in our endeavor to ensure that “participants be *fully* empowered to act” (tactical) (p. 250) in their attempts to make change to existing structures. Subsequent chapters will explore the extent to which these criteria serve as measures of the quality of this research as I examine the ways in which individual and collective transformation were catalyzed and realized in my chemistry classroom and in the lives of the participants in this study.

2.7 DATA COLLECTION

My students and I brought an emic or insider perspective to the study while Sarah-Kate brought an etic or outsider perspective to the data collection and analysis (Guba

& Lincoln, 1989). Data were collected during a full academic school year, concentrating on the interactions within our chemistry classroom, but also in fields outside of the classroom like the lunchroom, other classes, and at school functions like sporting events or dances. These multiple data sources, included texts (such as field notes, interviews, transcripts of video and audiotape) digital videos, videotapes of classes, and artifacts collected from the classrooms (e.g., student work samples, handouts, and official documents such as report cards and standardized test scores). A variety of perspectives were employed to analyze data resources. These perspectives include those university, student, and teacher researchers from our school site as well as those from other school sites in the DUS project. In the following sections, I introduce the data resources and the methods of data analysis for each.

2.7.1 Classroom Observations:

2.7.1a Video: Standard classes and laboratory periods were video-taped two to three days a week, either by a university researcher, a student, or from a fixed position in the classroom. My chemistry class met at different periods every day of the week and in three different rooms, requiring the university researcher to schedule accordingly. As our initial introduction to the presence of a university researcher had not been entirely positive, both my students and I were wary of the arrival of a new researcher. For this reason, Sarah-Kate would often arrive at the school a period before class and/or remain a period afterwards in order to talk with me (and students) about the class. In an effort to establish trust between students, Sarah-Kate, and me and to solidify her presence in the class as a participant observer (someone who the students learned to see as a resource for their learning), we made a conscious decision to forego videotaping the class for the first two weeks of her involvement in the class.

After this initiating period, Sarah-Kate began taping the class several times a week. The classes were usually recorded from varying positions within the classroom depending on the particular activities and questions that needed to be answered that day. Sarah-Kate used a handheld camera and traveled all around the room to capture different interactions, often zooming in on groups of students or me as I worked with different students. On occasions that Sarah-Kate was assisting students in the class or

was absent, I (or a student) would tape the class for short periods of time (such as student presentations). Over forty-six days of the school year were videotaped or audiotaped resulting in about 80 hours of data resources.

2.7.1b Audio: In addition to being videotaped, many of the classes were audiotaped by placing a recorder with a flat microphone on the lab table in the center of a group of students. The recording quality of these tapes was adequate to record group interactions and to provide data about student interactions both with and without my presence during group discussion. These recordings were made one-to-two times a week at various tables during both times of instruction and social interaction. Student researchers also audiotaped interviews with one another about class, school, and their home lives. Audiotapes were used to record interviews with students conducted by Sarah-Kate or me in both formal and informal discussions about class and home life. Students were asked to review audiotapes alone or with a co-researcher to identify salient conversations recorded from class and were then asked to describe and transcribe these conversations. At times, students were asked to discuss some parts of the transcriptions with other students in the class to try to identify important teaching/learning moments.

2.7.2 Student Researchers

In order to gain perspective about what it is like to be a student in *my* classroom, it was crucial to include students as researchers. Also, because student practices and achievement is a major focus of this study, students play a prominent role in the data collection process and analysis. Because research findings suggest that low-and middle-achieving students benefit the most from the use of peer-mediated learning, it was important to make sure to obtain feedback from various types and levels of learners. Had I chosen only high-or only low-achieving students to participate, I would have access to a very limited perspective of what my class was like for that type of student. Thus, to choose which student researchers would be involved in the research and who would be interviewed, a hermeneutic-dialect process was utilized. The first student researcher chosen was a high-achieving female of Cambodian-Chinese descent, with little social capital among her peers. The second student chosen needed to be the opposite from the first student, so we chose an African-American female with high social capital, but low cultural capital (i.e., knowledge of

science). While the two females differed in most respects including ethnic and religious backgrounds, primary language, achievement level, cultural capital, social capital, and attitudes toward science and school, the contradiction was that the two students both came from low socioeconomic backgrounds and lived in single parent homes in impoverished areas of the city.

Initially, four students (two males and two females) were selected to participate in the research, but only the two females accepted the offer. The two boys were reluctant to give up their lunch periods for research meetings and gathering data because they often played basketball or caught up on homework during that time. Therefore, when the study began, only two female students Chandra and Yanque¹⁰ were employed. Primarily through traditional ethnographic means, Chandra and Yanque accessed data about the curriculum and teaching strategies by recording classroom observations, maintaining journal entries, interviewing class members and analyzing videotapes for salient events. These two students were paid \$7.50 per hour for time spent interviewing other students, transcribing interviews and audiotapes of the class, writing journal entries, and analyzing videotapes. In addition, they were required to attend several meetings a week at the school, but were not paid for their involvement in these discussions. However, food and snacks were provided because the meetings generally occurred during their lunch period, meaning they would have been unable to eat if food were not provided.

The evolving nature of ethnographic research allowed for additional student-researchers to become involved in the study as more students from the class became interested in participating. Consequently, about a month and a half after Sarah-Kate arrived, the number of student researchers who were consistently accessing data sources and directing the course of the study grew to become a group of five African-American/Black females¹¹, one female of Cambodian-Chinese decent and one Caucasian male. Although this group of student-researchers was maintained throughout the remainder of the research, by the end of the study about three-quarters (approximately 17) of the chemistry students were involved in some way or another in accessing data sources, completing video ethnographies, transcribing audio tapes, selecting video vignettes from class, and providing critique and

¹⁰ Names of the student researchers have been changed.

¹¹ Students self-ascribed the labels African American and/or Black to identify themselves on a survey.

feedback to improve classroom interactions classroom teaching and learning. In late May, a Ukrainian student, Uri, began helping with audio transcriptions and was paid \$7.50/hour for his work. Until this time, Yanque and Chandra were the only two students who were paid for their participation. However, snacks were almost always provided during meetings so students would not miss lunch.

2.7.3 Site-Based Research Meetings

2.7.3a Student Research meetings

In the early stages of the study, Sarah-Kate held research meetings once per week during the students' 45-minute lunch period as an opportunity for the student researchers to update each other about the progress of their research assignments, to discuss interview topics and questions, and to reflect on classroom activities. These research meetings were used not only as peer debriefing and member checking sessions, but also as a means for all participants to examine practices and classroom interactions, to monitor data analysis, and to contribute to the development of research understandings and themes. Additionally, this time was useful for developing new research-related skills (e.g., conducting interviews and analyzing videotape of class) and also provided a means for Sarah-Kate to interview the student researchers. These research meetings eventually evolved into cogenerative dialogues. They served as the initial site for Sarah-Kate and student researchers to engage in more structured discussions that are today characterized as cogenerative dialogues.

2.7.3b Lunch meetings

Once or twice a week, depending on changing schedules and the academic constraints of all involved, Sarah-Kate held less formal lunch meetings open to any student in the class. And while these meetings were open to any member of the class, they were usually only attended by the six female student researchers and Sarah-Kate. These meetings usually began by discussing classroom activities or by examining a videotape of a salient classroom event. It is important to note that while Sarah-Kate generally prepared an agenda for discussion, topics arose and changed according to participants' interests and concerns. Usually these lunch meetings were the source of interview or research questions, discussions about classroom change, and member checking opportunities. Some of these meetings were video or

audiotaped to document the participants' voices and ideas and were generally transcribed and shared with me to serve as a source of insight for classroom change.

2.7.4 Cogenerative Dialogues

Cogenerative dialogue (LaVan, 2004; LaVan & Beers, in press; Roth & Tobin, 2001; Wassel, 2004) is a discussion between stakeholders that examines shared events and experiences. Cogenerative dialogue provides a neutral field in which participants examine the conscious and unconscious parts of structure (Sewell, 1992), such as schema and practices that afford agency in the field of the school or classroom. Through cogenerative dialogue, students and teachers can discuss power relationships and the roles of participants (Seiler, 2002) as well as consider individual and collective activity, goals, roles, equity issues, curriculum and responsibility. The notion of shared responsibility is central to these discussions as participants reflect on shared experiences, power relationships, and the differing roles and perspectives of all those involved. Shared perspectives are used to inform the emerging understandings of classroom interactions, the quality of these interactions, participant practices and how these patterns of interactions contribute to the accomplishment of the collective activity of teaching and learning science. These conversations among participants are crucial in raising consciousness about different participant perspectives, providing a means of addressing social reproduction by examining sites for both successful and failed interactions which can then be transformed to improve teaching and learning.

Emerging from early research meetings and lunch sessions between multiple participants, over time, these conversations developed characteristics that became salient features of our present model of cogenerative dialogue. In subsequent chapters, I clearly delineate the emergence and development of cogenerative dialogues from early research meetings and lunch sessions. In this study, cogenerative dialogues can be characterized as three different fields; formal cogenerative dialogues, informal cogenerative dialogues, and classroom huddles. Examined in greater detail in subsequent chapters, these three fields played a pivotal role in structuring the way science culture was produced, reproduced, and transformed in my classroom. In the following sections, I consider each of these fields: formal cogenerative dialogues between Sarah-Kate and student researchers,

impromptu “huddles” between me and Sarah-Kate or students in the chemistry classroom, and informal cogenerative dialogues between me, Linda, Stacey, and Sarah-Kate.

2.7.4a Formal Cogenerative Dialogues

In this field, Sarah-Kate and the student researchers focused on classroom interactions, teacher and student practices, and on how structures could be altered to make these interactions more successful for all participants. They used this time to analyze video vignettes from previous classes to identify and review practices that were unintended and unconscious in an attempt to identify and document patterns of coherence and contradiction. These cogenerative dialogues served to confront and breakdown the vertical hierarchies of power utilized in traditional research by promoting a dialectical and interpretative process whereby all participants could voice their ideas and direct the course of the research. And while these conversations often strayed from specifically examining the teaching and learning of science, conversations about relationships with peers and other teachers, school rules, activities in other classrooms and the importance of grades greatly enriched the research. These conversations were instrumental in fostering a sense of community and trust between the student researchers and Sarah-Kate.

2.7.4b Impromptu Huddles

Of critical importance to my development as a reflective practitioner was my regular participation in impromptu cogenerative dialogues with Sarah-Kate before, during, and after each class period. Tobin, Zurbano, Ford, and Carambo (2003) describe these “huddles” between coteachers as they “touch base” and “fine tune” lessons while “reaching agreement on what to do next and identifying and securing the resources needed to meet agreed upon goals” (p. 53). Thus, these huddles can be viewed as mini, informal cogenerative dialogues in which Sarah-Kate and I discussed the class both “in the moment” and as a reflection upon moments passed (Tobin, et al., 2003). In member checking about the use of these huddles, Sarah-Kate described why she thought they were so useful in reflecting on and restructuring the classroom.

I felt like I could see things Sonya could not see because she was in the spotlight, she was teaching, and was expected be on point for a lot of

different things. In the meantime, I was listening to class conversation and working with students in groups. So I could see some things she would not, but Sonya knew things I didn't about student histories in school and in their lives. Together, we were able to create a more complete picture of the classroom so that when we huddled, we were able to evaluate the whole picture and make changes "on the fly" to better support student learning. (Sarah-Kate, personal reflection, May, 2004).

Sarah-Kate illuminates the importance of huddles as a means for me to discuss salient events that transpired during the class, observations of specific strategies that either I or the students used or key patterns or themes of the research. Taking place several times a class period, these huddles provided an opportunity for me to reflect on the events of the class in "real time" which allowed me to make changes during the class period. The debriefings before and after class allowed me the chance to evaluate my lessons before implementation and to re-evaluate the lesson afterwards so I could consider revisions for future classes. Eventually, these huddles extended to include students where we would discuss classroom interactions "in the moment."

2.7.4c Informal Cogenerative Dialogues and Debriefing Sessions:

A third type of cogenerative dialogue occurred among DUS participants who were active in research at Urban Magnet. These informal debriefing sessions were useful in that we could compare what was happening in different classrooms at Urban Magnet, revisit theory we had been discussing at seminar, and share analytic frameworks and findings. According to Roth (1998), debriefing sessions between co-participants can lead to greater understandings about events and present possibilities for future change by making explicit the events and practices that often go unarticulated.

Although these informal discussions were not usually audio-recorded, field notes were customarily written during and/or after the conversations. In addition, the four of us remained in constant contact via daily emails, regular phone conversations, and weekly seminar meetings. In addition, because Sarah-Kate and I were in the same Masters of Chemistry Education program at the university, we met both before and after classes on alternating Saturdays each month.

Similar to my participation in the weekly seminar series, participation in these informal cogenerative dialogues with different members of our research team at

Urban Magnet increased my understanding of and confidence in the aims of the DUS project while providing a space that encouraged (and reinforced) personal relationships between me and the other university and teacher researchers involved in the study. Crucial in building a sense of trust and mutual respect among us, these discussions fostered a mutual understanding that Linda and I were acting as *researchers* and not just being *researched*. These conversations fostered a sense of solidarity between all participants in the study that permitted us to take risks with one another, allowing us to make structural changes that altered our schema and practices regarding our teaching practice and the nature of science. Specifically, participation in these discussions provided Linda and me with the structures necessary to support our growing dispositions to co-examine our teaching practices with one another and our students even in the absence of Stacey and Sarah-Kate. Provided with these tools, we were able to support one another in the continual re-evaluation of the nature of science and science teaching to better serve our students.

2.7.5 Limited Time, Not Limited Participation

Because I teach in both the middle and high school, I had only one common lunch with the high school students each week. Unfortunately, this lunch period was also intended for use as a science faculty meeting twice a month, meaning I was not usually able to participate in the Wednesday lunch cogenerative dialogue sessions with Sarah-Kate and my students. Towards the end of the second semester, the faculty meetings were moved to a classroom across the hall from the classroom in which Sarah-Kate and my students met, so I was able to occasionally move between the two meetings in an effort to be present at both. Many of these meetings between Sarah-Kate and the students were video or audiotaped, thus enabling me to “stay in the loop” in a more personal way. In addition, I always spoke with Sarah-Kate and the students after these meetings so I could remain informed about the issues discussed.

While this “alternative” participation route was not ideal, I never felt that I was on the outside of things. Both my students and I recognized that my schedule did not allow for us to meet at a common time, but this never prevented me from feeling that I was as involved in these discussions as if I had been there in person because communication between all participants was so constant. Students were made well

aware that while I was unable to attend these meetings, it was expected that information from these meetings would be shared with me as it was with other participants in the study. The research itself was built on the tenet that through the distribution of gained knowledge, participants would become increasingly aware of the perspectives of others. If and when students wanted to share information with me, Sarah-Kate, or other researchers in confidence, the students did so knowing that while their names would not be revealed, their perspectives would be shared with others. All participants were constantly reminded of the importance of making sure we all felt safe in these discussions, but that it was equally important to help others gain an understanding of differing perspectives by sharing concerns with everyone in the study. For this reason, I feel that my inability to attend these meetings did not negatively affect our goals of transforming the teaching and learning in our classroom and that again, this speaks to the necessity for a flexible, emergent design model for research in urban classrooms.

2.7.6 Field Notes

As a teacher-researcher, I did not really have the luxury of taking detailed notes during the chemistry class because I was teaching, but I did keep a field book available to note interactions I found to be especially salient. As university researcher, Sarah-Kate (and Stacey initially) kept detailed field notes of their observations, reactions, and questions which both serve as data resources for this study. These field notes reveal the emergent nature of the research process as well as provide a guide for data analysis and writing. These notes often serve as placeholders for video resources indicating the dates on which we can review specific classes and interactions of interest.

2.7.7 Formal and Informal Interviews

Both formal and informal interviews were used throughout the course of this study. Audiotape (and occasionally videotape) was generally used to capture formal interviews in which only salient parts were transcribed. Informal interviews were documented through field notes and follow-up formal interviews.

2.7.8 Written Narratives, Electronic Journals, and Electronic Communications

My students and I were often solicited to write narratives (in paper and electronic form) about our experiences or in response to events. These narratives help provide

more detailed insight into particular issues, thus often serving to guide the research questions. In addition, I saved all email communications between my students, the university researchers, and me. These electronic communications often took the place of my field notebook or journal as I participated in discussions about classes, students, and the direction of the research with various participants (including DUS participants).

2.7.9 Artifacts

The students and I produced a variety of artifacts that were instrumental for understanding emerging patterns. These included but were not limited to: transcriptions, raps/poems, video ethnographies, Power Point® presentations, changes to the curriculum (e.g., new activities), and student work. Interpretation of these artifacts occurred through a variety of means.

2.8 DATA ANALYSIS

Guiding my approach to data analysis and interpretation was my belief that critical ethnography must be both catalytic and reflexive in nature. Unlike traditional ethnography in which researchers collect their data, then take it all back to their office for analysis – far removed from the community in which the study took place – critical ethnography requires that data analysis and interpretation occur continually in an effort to effect change immediately to benefit the participants in that study. To this end, cultural sociology was employed to recognize patterns of both cultural coherence and contradiction (Sewell, 1992) as they emerged and when considering steps for catalytic action. In an effort to make claims concerning both these coherent and contradictory patterns, I employed a multi-tiered approach spanning macro-, meso-, and microscopic levels to provide an understanding of the varying and complex nature of social realities in the classroom. This approach is necessary because claims supported at one level of analysis (e.g., meso level) may be supported or contradicted at another (e.g., micro level). For this reason, all three lenses must be employed in analysis of multiple data resources to provide an accurate account of our findings. Because ethnography is lived life and everyday experience in which cultural interactions occur, we can think of it as continuously unfolding – filled with various coherences and contradictions that can be identified and described via meso- and micro-level analysis.

Meso-level observations occur in the everyday unfolding of events and can be documented by traditional ethnographic means, such as field notes, transcripts, journals, and interviews. Meso-level data resources are essential for developing a sense of what is occurring in the classroom. Viewing videotapes at a meso-level perspective (that is, normal speed) allowed me to describe interactions between students and me during classes and to develop a broad understanding of class activities and engagement patterns. Patterns of coherence and contradiction identified at the meso-level serve as a resource for future analysis at the micro-level, where we gain a greater understanding of how the practices and interactions observed at the meso-level are affecting classrooms on a more subtle level.

Analysis of data resources, such as video vignettes and transcripts, at the microscopic level provides details that are not easily recognized at the mesoscopic level. Transcript analysis at this level reveals instances of overlapping speech, emphasis, and pitch. Microanalysis of video involves viewing vignettes at different speeds and directions (e.g., fast forward and reverse, frame by frame, super-slow). Manipulation of time provides greater detail by revealing subtleties and patterns in teacher and student practices that are not easily identified in real time (e.g., subtle movements, non-verbal communication, and fleeting and peripheral actions and events) but that are readily apparent when examining facial expressions, eye gaze, body position, and use of resources. Analysis at this level is consistent with cultural sociology in that it provides a way to examine the practices that are enacted at an unconscious level, thus revealing the underlying structures, which we want students and teachers to become aware.

While meso-and micro-level observations provide us with a sense of what is occurring in a certain time or space, macro-level observations are important because they extend past the interactions in this classroom, allowing us to consider the ways in which student and teacher practices change over time (e.g., across semesters or eighth to ninth grade) and in different fields (e.g., the lunch room, hallways, or other classes). Claims for patterned interactions and practices become more significant and pronounced when documented over time and/or in different fields. For this reason, macro level analysis is an important aspect of this research in that it invites me to consider the transformative potential of science in a student's life during their school

career and beyond. Research conducted by students was crucial in providing data for macroscopic analysis as students provided me with access to their experiences in other fields (both within the school and in their neighborhoods) via their journals, field notes and, especially, their video ethnographies. These video ethnographies provided a better understanding of how the cultural symbols and practices we observed in the classroom were related to those we identified in our classroom.

2.8.1 Video Data

Videotapes can be described as “renewable” data sources, which are important in analyzing classroom dynamics and micro interactions between the teachers and students (Kemper & Collins, 1990). This video can also be used to enhance the audiotapes of class discussion by including body language and gestures not available in audiorecordings alone. Vignettes selected for microscopic analysis were collected using the video-editing program *iMovie* that enabled me to slow the video to tenths or hundredths of a second so as to isolate and focus on the enacted practices and interactions between different individuals in the class. By focusing on gestures, body movements, physical spacing and orientation of participants, and the emergence of solidarity and mutual focus among members of the class, I was able to identify and examine structures that afforded certain practices in my classroom. In addition, students analyzed tapes to identify salient nonverbal or verbal behaviors and interactions they thought were connected to the learning and teaching of science and how they thought these interactions affected their learning.

2.8.2 Discourse Analysis

Discourse analysis of audiotapes and videotapes provided a second means by which to substantiate claims at the macro and mesoscopic levels via micro level interactions. Both “oral and written texts” (Hicks, 1995) (from video of classrooms interactions, tapes of meetings and group work, and journals) were examined “after the fact” as a means to reconstruct “moment-to-moment interactions” (p. 51) for analysis of participant interactions across time and in different fields while engaged in a variety of activities in an attempt to gain a deeper understanding of participant practices and interactions across fields. Transcript analysis is made possible using a series of discourse conventions (Wortham, 2001) outlined in the appendix. These conventions enable analysis of a variety of discourse situations that provide

information about cultural interactions and practices on both the meso- and microlevels.

2.9 CONCLUSIONS

2.9.1 *Looking Ahead*

The objective of this study was to examine the impact of structure and the social and historical contexts of lived experiences on my teaching practices and on student achievement in the context of the science learning that took place in our tenth grade chemistry classroom. Chapters 3 and 4 describe the social, cultural, and historical contexts in which both my students and I have experienced school and schooling in an effort to explore the practices and schema we each bring to the field of the classroom. These chapters speak to the importance of social life in addressing the goal of transformative science education, setting the stage for the interpretive data chapters 5, 6, and 7. Chapter 5 describes the use of cogenerative dialogue as a pathway to collectively examine student and teacher schema and practices regarding the production and reproduction of science. Chapters 6 and 7, through both micro- and meso-level analyses of video interactions in the classroom, reveals the ways in which classroom structures were transformed as a result of this collaborative research effort to provide students with greater opportunities for success in our chemistry class. Specifically, these chapters examine my changing assessment practices and the development of dispositions associated with scientific fluency (Tobin, in press) among students who have not traditionally been successful in science classes. Claims made in each chapter will be accompanied by evidence of contradictions and will be supported by multiple data resources. Chapter 8 provides a brief epilogue of the structural changes that took place in our classroom in the last three months of the school year, concluding with an examination of some of the questions that emerged as we ended our year of classroom research and began to reflect critically on how these experiences would affect our lives in the future. In the final chapter, I provide a summary of the main findings and conclusions and discuss the implications for teaching, teacher education, professional development, and educational research in the broader context of education today.

CHAPTER 3

NOT SO STRANGE IN A STRANGE LAND:
AN AUTOBIOGRAPHICAL APPROACH TO BECOMING
A SCIENCE TEACHER IN AN URBAN HIGH SCHOOL.

3.1 IT JUST HAPPENED

It took only one phone call home after officially entering the Graduate School of Education at the University of Pennsylvania to have me seriously examine my reasons for becoming a teacher. “You don’t even like kids,” said my incredulous grandmother on the other end of the line. After our conversation, I began to think about the audience for my future teaching career. I realized that, in fact, I had very little contact with children other than my peers in my own childhood. When asked now, at the end of my fifth year as a teacher, “Why did you want to become a teacher?” I respond, “I didn’t set out to *become* a teacher, it just happened.”

3.2 ON THE OUTSIDE LOOKING IN*3.2.1 Conflicting Views*

Being raised in a household with conflicted values concerning education, I was uncertain how to feel about school and my teachers. My grandfather, who by the age of 15 had not yet advanced past the fifth grade, insisted that I “learn my letters” and “learn how to do arithmetic so no one could cheat me out of my money.” As a sharecropper in the rural South, he was allowed to attend school only a few months of every year, and, as a result, he was never able to advance. He stayed in school longer than many of his 10 siblings, but adult responsibilities and shame finally forced him to quit. My grandfather often lamented the fact that he was unable to “get an education” because he felt it was the only way to get a “good paying job.” Each afternoon, upon returning from school, my grandmother made sure that I “got my lessons up” before going out to play. She sat next to me as I completed my assignments, assuring me that even though she could not help me with my work, she would sit next to me until I was finished.

As a child, no one ever told me, “You can be whatever you want when you grow up.” I was never told what I *could* become; only what I should *not* become. I was

forbidden to ever work in a sewing factory or a chicken plant, jobs held by most of the women in my family. My mother, who gave birth to me at age 15, told me on a daily basis that I had to do my best in school so I would not end up like her or my grandparents. Her words insinuated that she and my grandparents were not acceptable and had failed in some way. Their persistence that I succeed in school drove me to achieve academically as I knew they were all counting on me to do what they had been unable to accomplish themselves. I was made aware of the importance of “getting an education,” but neither my grandparents nor I really knew what that meant, or the cost we would pay to achieve our goal. In fact, growing up, the cultures of my home and school were often at odds, both academically and behaviorally. While being urged to excel in school, I was chastised and called lazy when found reading a book for leisure, something for which I was praised at school. My home culture often clashed with school expectations of behavior as well. In second grade, a bully began to harass me and when the teacher did nothing to stop him, I told my grandfather. To my surprise, he spanked me and said he would do so every day until I stopped the bullying by “showing respect for myself.” The next day when the boy pinched me, I picked up a chair and struck him in the head, sending him to the hospital for stitches. Although disciplined at school, my grandfather rewarded me at home, proud that I had taken up for myself, assured that “no one would mess with me again.”

3.2.2 *She Has So Much Potential*

By high school, I had achieved autonomy from my grandparents in terms of school-related issues. Administrative needs often seemed foreign and alienating to them as they had difficulty reading and felt intimidated by status and position. For this reason, teachers often consulted me directly to discuss my academic performance, and they rarely included my family members as part of my educational experience. Teachers often commented about my *potential* as a student and my *potential* to succeed and the *potential* to be something more than my family members had accomplished. By “potential” I understood them to mean that I had talent without opportunity. So, although I was driven to excel in high school, I never considered what would come afterwards since I had no concept of the opportunities available to me. My life experiences, at that point in time, did not lead me to expect that I would go on to college. Moreover, I had no intention of applying to college and made no

plans to do so. However, in my junior year, a counselor arranged for me to take an AP exam in U.S. History, paying the cost himself. The scores from the exam were reported to various colleges, and shortly thereafter I began to receive information from their recruitment offices. The counselor insisted that I apply to at least one college, so I randomly chose and applied to Bryn Mawr College, a small women's college in Pennsylvania, making a decision that would alter my life forever.

3.2.3 Act Like a Lady

When I was asked to travel to Atlanta, over two hours away, to interview with the regional college representative, both the school administration and my counselor were thrilled at my success. A woman from the Board of Education took me shopping to buy a new outfit that would be appropriate for the interview. I was asked to attend local meetings of the Daughters of the American Revolution where I was taught how to “act like a lady.” These women drilled me on how to properly cross my legs, how to speak, and even how to properly drink tea – all so I could conduct myself appropriately during the interview! The school also arranged for me to be driven to Atlanta. Upon acceptance to Bryn Mawr College, I was struck by the reaction of the school and my teachers. While they certainly had a hand in my acceptance, they completely neglected the contributions and sacrifices my family had made to help secure my success as well. Their reaction also seemed to negate my own role in the college's offer, making the achievement seem impersonal and unconnected to me.

3.2.4 The Great Divide

On scholarship to an elite private college whose traditions and customs were outside my realm of experience, I often felt out of place and isolated. I struggled to make sense of my new environment yet received constant reminders that I did not belong. I began to be positioned as “Other.” Students and professors alike continually made fun of my heavy Southern accent, suggesting that my slow manner of speaking was directly equated with my intelligence, or lack thereof. This bigotry confused me as I was surrounded by people of races, religions, languages, and accents unlike any I had ever experienced before, yet no one made fun of them. Jokes such as, “If your mother and father get a divorce, will they still be brother and sister?” were commonplace, acting to silence and separate me from my peers. During visits home,

I experienced the same ridicule in reverse from friends and family, who accused me of “putting on airs” as I unconsciously began to lose my accent and adopt new mannerisms. Surprisingly, my family’s desire for me to succeed academically and to *become somebody*, eventually distanced me from them, both physically and emotionally, by positioning me again as “Other,” this time in comparison to my family. I struggled with this double-sided alienation, both socially and academically, during my first two years of college as I attempted to hang on to my former identity while trying to fit into a new environment. While that was a difficult period of my life, I later realized that my experiences before and during college greatly influenced the type of teacher I later became and the types and quality of relationships I developed with my students.

3.3 SETTLING ON BEING A TEACHER

3.3.1 Uncertain Certainties

By my sophomore year, I was firmly established as a pre-med Biology student with a concentration in neuroscience. I chose to major in Biology during my first year partly because I enjoyed the subject but mainly because it was the only subject that was not novel to me and in which I seemed to succeed. Similar to my high school experience, I had no template for how to proceed in college, having had no one after which to pattern my behaviors. For this reason, I relied heavily on the advice of my dean and professors to make decisions. In the beginning of my senior year, I began the process of applying to different medical schools and preparing for life after college. However, I still held a very limited view of what a person could do or become that would be considered successful. I believed becoming a doctor to be the pinnacle of success, so attending medical school never really seemed to be a choice at all, only what was expected from me – living up to my potential. Consequently, I had not really considered what it might take to become a doctor, only that my family, friends, and professors were happy with my decision to proceed in that direction.

3.3.2 A Life in Transition

An early morning phone call in the second semester of my senior year altered my plans. My mother, my two-year old sister, and my best friend from high school were involved in a serious car accident. My experiences with my mother in the Intensive Care Unit led me to withdraw my medical school applications. I decided I could not

perform the duties required of the nurses and physicians who had tended to my mother and family, including helping us make the difficult decision that finally ended her suffering.

After the funeral, I immediately returned to school to finish my coursework, as my scholarship would not extend past May. The next few months were a blur as I tried to concentrate on completing my senior thesis and passing final exams. After graduation, I began searching for an alternative to my long-standing plans for medical school. I saw no future in returning home, so with the help of an alumnae connection, I secured a research position at the Veterinary Hospital at the University of Pennsylvania. The benefits of the position allowed employees to take courses at the University for free. Feeling that I would be at a loss without the structure of school and an academic learning environment, I gladly took advantage of the benefit.

3.3.3. Developing Interests

While working at the University of Pennsylvania, I enrolled in a Human Development course that examined both the physiological and psychological development of humans, but that mostly concentrated on childhood development and the process of learning. Many of my classmates were undergraduate education majors and they suggested I continue with them in the spring to the next course, Anthropology of Education. It was during that course, nearly two years after my mother's death and graduation from college that I began to consider pursuing a degree in Education. I began to re-examine the world around me and to re-evaluate my own educational experiences and life expectations. The readings for the course radically changed my life view and goals. Books like *Jocks and Burnouts: Social Categories and Identity in High School* (Eckert, 1989) and *Ain't No Makin' It: Aspirations and Attainment in a Low-Income Neighborhood* (MacLeod, 1995) awakened something inside of me I had not known was there. I became very interested in theories about culture and the powerful influence of social reproduction in people's lives.

I found that the theory of social reproduction was of particular significance to me. I was the first person in my family to graduate past the eighth grade, and, at the age of 24, I was unmarried and childless, a feat in and of itself in the community where I was raised. What piqued my interest most about the theory was the glaring

contradiction of my life experience to that of my family and most of my childhood friends. I was an anomaly because I had escaped their fate. And so it was through the words of people like Bruner (1996) and Dewey (1916) that I began to consider the purpose of education in society and its influence on a child's development and socialization. At this point my interest in educational theory was on a personal and academic level as I had not yet begun to consider the practical implications of educational theory to teaching and learning.

3.3.4 The Next Step

By the following fall, after completing two more education courses, I decided to join the teacher education program full-time. It would be nearly two years before I encountered my first pupils. When I finally arrived at student teaching, the theoretical suddenly became practical as I met my morning and afternoon classes, each consisting of twenty eager kindergarten students. By the end of the day, my grandmother's words had played through my head a hundred times, "But you don't even like kids."

The next four months were a mixed blessing of sweet, enthusiastic learners and a first-hand opportunity to experience many of the problems associated with education about which I had been reading. My placement in a White, middle-class, suburban setting was not what I had expected, but during that time, I learned a great deal about the kind of teacher I did and did not want to become. I went to a different school mid-year, completing my student teaching with two different cooperating teachers in an urban magnet school. My new placement in a fifth-grade science class and a ninth-grade biology class allowed me to become certified to teach K-12. Yet even more importantly, I reached the realization that it was not that I did not like children, but that I liked working with older children best.

3.3.5 Theory and Practice

It was during my time as a student teacher that I began to realize the possibilities of how I could teach both responsibly, by presenting my students with accurate and objective information, and responsively, by tailoring lessons to promote real thought and discussion in my students. As an educator, I realized I wanted to encourage students to think independently, to question knowledge, and to learn to relate the knowledge they acquire to their life experiences and vice versa. I became certain that

students would feel empowered by the learning process when they developed confidence in their thinking abilities so as not to rely on others to decide what knowledge is valued or valuable for them to acquire. It became very important to me as a new teacher to help students foster ownership of knowledge and experience. Education, as I envisioned it, was about providing students with the tools to explore and think about the world around them, not about learning what it means to succeed as defined by someone else. My beliefs about education, although better developed by my coursework in the education program, actually grew from my own experiences as a student. Thus, my main educational goal as a teacher was to assist children to think and to become life-long learners in order to develop their own sense of success based upon their own values and culture.

3.4 ONE OF THESE THINGS DOES NOT BELONG, OR DOES IT?

3.4.1 Theory Out the Window

My first few hours of solo teaching in an urban setting, sans co-operating teacher, convinced me that I had no idea what I was doing and that the only thing of which I was certain was that I was a horrible teacher. Looking around the room at the 35 African American students staring expectantly at their new, inexperienced White teacher, they knew I would not last three days. And so it began - the daily struggle, tortures, and trials that became my first year of teaching at Dewey Middle School in West Philadelphia.

The students and I began each day anew, waiting for the unexpected and reacting the only ways we knew how. I realized early on that having seventh grade level books in a seventh grade class was not ideal if the majority of students read on a third or fourth grade level. My class was self-contained, meaning that I taught all subjects. I quickly learned that novel, interesting lessons would not be a mainstay in my classroom for I was overwhelmed by the needs of the students and my inability to gain control of their behavior. My class, it turned out, had been together for the past two years, in which time they had over 30 different substitutes and never a regular classroom teacher. It seemed as though everything I tried failed. Student behavior seemed wildly unpredictable. I tried very hard to be the type of teacher I thought I was supposed to be, but I met with failure again and again. I came to school each morning with an upset stomach and went to sleep each night crying about the events

of the day. I felt alienated from my students, by race and by the beliefs we held about one another. But over time, I began to understand how our cultures, despite being different, were also similar in many ways.

3.4.2 Earning Respect and Gaining Acceptance

I quickly found that while my ideals had worked in an environment where structure had long been established, like at the school sites chosen for my student teaching experiences, the students in my class practically revolted if the periods were switched in which spelling and math were taught. Non-traditional teaching styles were not well received in my new environment but I slowly learned, through months of trial and error, to institute a sense of order and consistency in my teaching upon which my students relied. Although my class was far from perfect, the students began to accept that I was not going to abandon them, no matter how hard they tried to make me leave.

This realization occurred sometime in the second month of school when a transient student re-enrolled into the class. By that time, I was used to students leaving and re-enrolling as they and their parents moved in and out of our school boundaries. However, the announcement of the arrival of this student in particular sent my class into chaos. They began immediately to recount stories of how she had hit one of the substitutes in the past and how she had made several teachers depart, one even leaving during the middle of the day without informing the office. Many of the students were openly concerned that I would finally leave them, and I must admit, their stories did little to set me at ease. As it turned out, the “showdown” was as spectacular as they had envisioned. Within an hour of her arrival, Ciera began challenging me in front of the class. She refused to do assignments or participate in class activities. As her misbehavior escalated, I noticed the other students becoming increasingly agitated, in anticipation of her inevitable eruption. At one point, Ciera jumped from her desk knocking it to the floor screaming how she had hit that “White teacher in the fucking mouth” and now she would do it again. I had tried to maintain what I envisioned to be the actions of a mature, responsible teacher during her previous outbursts, but her threat angered me so that I snapped! In a grand sweeping motion, I knocked everything from my own desk while yelling, “If you think you want to hit me then come on!” I then added, for the benefit of the whole class that

“my own mother had whipped my ass worse than they ever could,” so if any of them wanted to try and hit me, they now had the chance! Much to my surprise, and relief, Cieara sat down and the class worked silently for rest of the period.

3.4.3 A Turning Point

While this was the most extravagant display of violence to grace our classroom, it afforded me a new sense of respect from my students and even from myself. To me, this incident was a reminder that I would sometimes need to take a situation into my own hands, even if it meant handling the situation in a way that may not be sanctioned by the dominant school culture. The attitude of my class changed dramatically after that day. I feel the students decided that because I had stood up for myself, I not only cared enough to stay, but I had the ability to “make it” in their environment. Students often commented that whenever I was upset, my accent became heavier, often eliciting a warning from one student to another to “lay off, ‘cause Ms. Martin gettin’ ready to go backwood on you.” It was after this incident that I began to handle situations more instinctively, listening to the needs of my students in a new way, and I found that we had much common ground upon which to build a better relationship. I began to notice that students responded more when I dropped my guard and spoke with a heavier Southern accent. Students said it was comforting and reminded them of their grandmothers and other relatives who were either from the South or whom they had visited in the South. Many of these students’ families had migrated to the North from Southern states and being poor and from the rural South meant that I shared many cultural experiences with them, including food and religion. I found that I was in a situation where these students were actually appreciating my culture and I found that I could appreciate theirs. So while I still felt like a failure as a *teacher* (someone that disseminates information and knowledge), I knew I was committed to my students and I was slowly building relationships with them and their families.

It was also during this first year of teaching that the head of the education program from which I had just graduated proposed that he bring his class from a local high school to work with my class on science projects on a daily basis. I was horrified! Although I was gaining some ground with students in my class, every day some event would occur that would rock my foundation as a novice teacher, and now my

mentor wanted to come and be witness to my shortcomings. I reluctantly agreed to his request, hoping to learn from his example and, thus, I began down the road to *becoming* a “real” teacher.

3.4.4 A “Real” Teacher

Well, this was it. I was going to see how a *real* teacher would handle these students. I was going to see magic in the classroom, the likes of which I did not possess. What I saw permanently changed my view of myself and of teaching. My mentor came with students from *Incentive* SLC at City High to *do science* in my classroom. The experiments themselves were not eventful, nor were the student experiences. What was important for me, as a teacher, was to see my mentor, a teacher of thirty-plus years, struggling to *teach* the students in my classroom. I had honestly thought an experienced teacher would work wonders with my students. I thought the students would respond with new enthusiasm and become instant scholars. What I saw was a man struggling to control the students and making many of the same mistakes I made daily. I saw an experienced professional failing “to teach,” and my perception of *my* ability to teach my students changed dramatically.

Suddenly, I realized there was no magic to teaching. There was no easy way to reach my students. And although our science outings eventually ended with one of my students dropping a potted bean plant out of the third floor window onto one of the high school students, I had a new sense of what could reasonably be accomplished. This transformation in thinking required losing my image of what a teacher was supposed to be in order to become the teacher my students needed. I began to look at each day as a new beginning and kept trying new methods. I began to handle situations more instinctively, listening to the needs of my students in new ways, and finding that we had many common experiences upon which to build better relationships. I learned the necessity of giving respect to students by valuing their culture and knowledge while simultaneously demanding respect from them. I worked hard to understand their vision of the world and to help them see mine. While growing up, I felt that teachers did not communicate to students on a personal basis, but at Dewey Middle School, I learned to relate to my students on a personal level and them with me. As the year advanced, I traveled to the police station on three different occasions for student-related crimes and I was present at the sentencing

trials for two of those students. I attended three wakes in the homes of my students for lost family members. I visited students in shelters and hospitals, and I purchased clothes and toiletries for a student, without parental assistance, who was placed in a mental health facility. I held children while they cried and I held the hands of parents and grandparents who did not know what else to do for themselves or for their children.

Today, when I look back on my first year, I do not remember teaching my students much in the traditional sense of the word. Yes, we examined worms and sea monkeys in science class and traveled to the art gallery to study impressionist art. But the real lessons I taught and learned that year were based on how to develop a community. I had class discussions in which boys and girls alike cried openly, expressing their fears and concerns for their future lives and those of their families. We discussed racism, sexism, poverty, and drugs and the roles of each in their lives. We built a community based on trust, where I learned that being a teacher is not only about books, tests, and projects, but also about meeting the needs of my students in all aspects of their lives. So while I often felt like a failure as a teacher in the traditional sense of the word, I came to a significant realization about the kind of teacher I wanted to be. I realized the importance of listening to my own voice as a person and the value of sharing my experiences with my students on a personal level as a means of building community and trust between teacher and student.

3.5 THE OTHER SIDE OF THE COIN

3.5.1 Starting from Scratch

I still remember walking into my first chemistry class at Urban Magnet. I watched as the students filed into the room, choosing their seats for the term. Coming from my last teaching experience in an underachieving, predominantly African American school, I was challenged by the racial diversity represented by the class population. The class was about 60% White and 40% African American, Asian, or Latino. After a brief introduction, I asked the students if they had any questions. One student raised his hand, leaned back in his chair, and with his head cocked to one side asked, “Is it true you that you’re not even certified to teach chemistry?” I was completely unprepared for this student’s question and, taken off-guard, I admitted to the class that although I was a science teacher, I had not been certified to teach chemistry. I

could see I was quickly losing the confidence of these students as they began to bemoan the fact that they had been scheduled into my class.

3.5.2 A New Curriculum

As seen in my first encounter with the students at Urban Magnet, my new position held many surprises and challenges for which I was unprepared. Although certified to teach elementary education and secondary biology, I was assigned to teach a 10th grade academic chemistry course, two 8th grade physical science courses, and a 9th grade biology course. Needless to say, I was overwhelmed. I had always been enthusiastic about chemistry, but my content knowledge was severely lacking.

So now, in a new school, as a new teacher, I would be dealing with an unfamiliar curriculum and unfamiliar students. It did not take me long to understand that my first year of teaching in a “typical” urban school setting had prepared me to control students, but certainly not to teach them science. Each night I busied myself preparing lengthy scripts, including notes as to when to write on the board and even jokes to add if the classroom climate allowed. I practiced chemistry problems each night and tried to stay just a few pages ahead of the students in all of my classes. It seemed as though the students purposefully tried to expose my ignorance by asking impossible questions during every class. They made sport of all my shortcomings, picking on my Southern accent, correcting my English, and being hyperconscious of the smallest mistakes, such as misspelling a word on the board.

Every raised hand seemed like a challenge to my authority as a teacher and if I had learned one thing from my previous year of teaching, it was that a teacher without authority and student respect could never teach, no matter how prepared she was for a lesson. Filled with the memories of just how out of control a class could become, I was determined to gain control of the situation. In doing so, I completely over-reacted. Even at the end of my third year of teaching at Urban Magnet, students still recall those first few months when I spoke like a drill sergeant, making some of them actually cry from fear. I laid down the law, trying to gain control of issues that had been of particular importance in my old school; not necessarily realizing the same issues might not be as important here. I had somehow become so immersed in the culture of my last school, that I did not consider that the culture of this school could be different and would require different tools if I were to be an effective teacher.

3.5.3 *What Do You Mean You Don't Know?*

Well into the third chapter of our chemistry text and in the middle of a class discussion about the nuances of wave theory as related to quantum mechanics, I realized I was completely unprepared for and unable to answer the types of questions my students were asking. Although difficult for me to say at the time, I finally threw up my hands and declared that I “have no idea how to answer your questions, but let me write them down and I will try to find out!” With a look of utter disbelief, one of the students exclaimed, “but you’re the teacher, what do you mean you don’t know?” His arrogance to ask such a question and his naïveté to expect someone could know everything actually helped put the situation in perspective for me. For the first time, I realized that I was arrogant to assume I could know everything and be prepared for all their questions. It was at this point that I finally let down my guard at Urban Magnet and actually took the first steps towards building the learning community. I realized that I was not being sincere. I had allowed my students to accept the fallacy that I knew everything and all they needed to do was listen to me in order to learn. I explained to the students that they were as capable as I was and that they could make as much sense from the book as I could. I told them I worked the problems each night just like they did, many times making the same mistakes as I went along. I admitted that many of them were undoubtedly more talented mathematically than I was and for that matter, even more intelligent. I continued, telling them that what was important was that I was trying my best and as soon as they realized that teachers were people who sometimes made mistakes, the sooner they would be able to benefit from my teaching.

From that point on, I began to ask if any student could better explain a concept on which I was unclear and if I was unable to solve problems, I asked students to show me and others how they had solved them. This was not an easy thing for me to do. I had to learn to put aside my ego and pride, and I found I was rewarded by richer class discussions and a feeling of camaraderie that developed in the class. Certainly some students still made pointed remarks about my shortcomings as a chemistry teacher, but I rarely had to come to my own defense as other students were quick to point out that I was doing my best and that was what mattered. Indeed, I have never experienced the same sense of kinship with later chemistry classes as I did with my initial class.

3.5.4 A Natural Progression

What happened next seemed like the only appropriate step to be taken. If I were going to teach chemistry well, I needed to learn more chemistry myself. The opportunity presented itself to me with an invitation to join the new Master's of Chemistry and Education (MCE) program at the University of Pennsylvania. I applied near the end of my first year of teaching at Urban Magnet with the knowledge and support of my chemistry class. My students were impressed by my desire to continue my education so I could better support their learning. Before the required taping of my class for the application process, students held an impromptu meeting, making certain the tape would reflect our best class effort for the admission committee. Upon acceptance to the program, my students congratulated me and in the years to follow, they continued to ask about my progress in the course and to express their support for my continuing education. My determination to return to school in order to better teach chemistry allowed me to gain social capital in a different way at Urban Magnet than at Dewey Middle. I began to realize there are different ways of gaining social capital with students and that it is necessary to do so in order to build relationships with students so that I could teach and they could learn.

3.6 BECOMING A REAL TEACHER

3.6.1 A New Approach

My experiences in the MCE program radically changed my perceptions of what it means to “know and do” chemistry and what it means to teach and learn chemistry. My involvement with the program allowed me to question traditional views of learning and science associated with previous experiences. One professor in particular, Dr. Bryan Roberts, made a profound impact on my ideas about the teaching and learning of chemistry. Doctor Roberts exposed me to models of teaching and learning that were different than I had experienced before. His use of an inquiry model introduced me to teaching and learning that emphasizes prior student knowledge and construction of student understanding and community learning. My own gains in knowledge and experience in chemistry and my interactions with Dr. Roberts have required me to take on a new role as a learner. This became significant in two ways in my classroom; I began to teach chemistry differently – relying heavily on group learning and student construction of knowledge and I had a better

understanding of what it means to be a student in a chemistry class. I am more aware of students' fears and concerns surrounding the learning of chemistry, and I am able to discuss my personal experiences of learning chemistry with them – again building a sense of community in learning. I am better able to understand their frustration with chemistry concepts and can provide examples from my own learning to help them find new ways to tackle tough problems. Doctor Roberts was also fond of incorporating a historical perspective, presenting the lives of scientists and the importance of new inventions in chemistry, making chemistry relate more to the real world and making me feel more in touch with the world of chemistry. My experiences with him as a teacher and as a learner in his class provided me with more knowledge of teaching and learning which I am now able to enact as I teach. Students often comment that they feel more in touch with chemistry when they learn concepts within the historical context of the discoveries we are exploring.

Having completed the MCE program, I feel more confident in my classroom and with the subject matter in general. I am comfortable with the idea that I do not know everything and I am confident in my ability to find out what I need to know in order to best support the learning of my students – including having my students explore a problem and suggest their own solutions. I am more certain of my ability to lead my class towards our goal of learning chemistry, all the while realizing that I am continuing to learn everyday. My confidence in the subject matter allows me to do many things I was afraid to try before, like stray from the confines of the book or freely and openly explore student questions without fear of not knowing the right answer. Being able to freely admit that I, as a teacher, am not privy to all knowledge allows me the freedom to seek additional resources both within and outside of my classroom. Doctor Roberts, who is a senior scholar at an Ivy League school, has demonstrated his extensive knowledge of chemistry and his ability to say he is not sure, and will look it up. Both practices have inspired me to be a better teacher and a more willing student in his class and I have been able to transfer this experience into my classroom for the benefit of my own students. Doctor Roberts allowed me to experience a teaching and learning style that relies heavily on community effort and I have found it to be an empowering experience for me as a learner and for student learners in the classroom. Just as students in Dr. Roberts' class feel empowered to

ask questions, so do my own students because they know I value their knowledge and I treat them as my intellectual equals.

3.7 LOOKING BACK

This autobiographical account of my journey of *becoming* a teacher has provided an opportunity to reflect upon my teaching from a new perspective and to grow from the experience. What I have learned goes beyond individual experience and has far-reaching implications for what it takes to be an effective science teacher in two profoundly different urban schools. Several themes have emerged from this historical analysis of my life as teacher and student that have been influential in shaping the teacher I am today.

3.7.1 *Teacher Knowledge*

As a child, I learned that teacher knowledge was the most important resource for learning in the classroom. My family and I regarded teachers as infallible. They were expert in all facets of life, holding the key to the world of success like a shiny carrot for me to follow. When I became a teacher, I had the same expectations for myself and I was overwhelmed by my seeming inability to perform as this perfect person I felt a teacher had to be. However, my experiences in both of my teaching environments and as a student in Dr. Roberts' class convinced me that no one person could possibly know everything. This allowed me to identify my shortcomings as a teacher as well as admit them to my students. Only then was I able to grow and become a better teacher. It is unfair and unrealistic for teachers to be portrayed as the holders of all knowledge, effectively robbing students of their contributions to their own learning and to that of their peers.

3.7.2 *Power in the Classroom*

I have learned that a real teacher promotes student learning in a variety of ways, and not all of them are safe for a teacher that is unable to admit her/his inability to know everything. Moreover, while relinquishing control of teaching allows students to actively participate in their own learning of science, student learning is most enhanced when they are encouraged to use their cultural capital as a resource for learning. This can be accomplished by promoting student knowledge as important and valued in the classroom. Group-focused learning and students acting as teachers are two ways in which students were empowered in my classrooms at Urban Magnet.

I encouraged students to teach chemistry concepts to one another in small groups as well as to the class as an individual or by utilizing group efforts. I found that allowing student opportunities to teach demonstrates to students that they also hold knowledge and can share information that is constructive and beneficial with their peers *and* their teacher. In this manner, my students began to see themselves as co-teachers and to view me as a co-learner in the classroom, thus elevating student position to a position of power and de-emphasizing the teacher role as the bearer of all knowledge.

3.7.3 Valuing the Culture of Students/Diminishing the Role of Other

Irrespective of the situation, my experiences have revealed that building social capital is critical to being an effective teacher. Recognizing student cultural capital as worthwhile and identifying what they know and can do as legitimate demonstrates a respect for students that allows their identities as learners to grow. By building social capital with students, I was able to form cohesive learning environments that acted to acknowledge and value their contributions to the learning environment. While the route towards building social capital is to *earn* the respect of others in a community, I discovered that earning respect in a community is clearly dependent on the type of community. At both Dewey Middle and Urban Magnet I had to find out what was valued and practiced in a community in order to gain the respect of my students. I learned that earning, not demanding or expecting, respect is a critical ingredient to becoming an effective teacher. Earning respect allowed me to be accepted by students as their teacher so that learning could begin. Furthermore, earning respect required that I enacted roles appropriate for *those* students in *that* classroom since a classroom culture is largely dependent upon what students bring from their lifeworlds, not only on what the teacher brings to the classroom. By respecting student cultures and building a curriculum that focuses on valuing student knowledge, the feeling of “Other” by marginalized students is reduced within a community that emphasizes learning for all while relying on the resources contributed by all.

3.7.4 The Power of Autobiography

When first given the task to write autobiographically about my teaching experiences, I had no idea how influential the experience would be on my teaching practice and

my view of myself as a teacher and a learner. The process now reminds me of watching my grandmother while quilting. After observing her gather odd squares of material and thread them together, I would sit and trace the outline of intricate patterns she had created with leftover materials from favorite shirts and clothes from family members. These “memory quilts,” small bits taken from our lives, were then all threaded together to make one, coherent piece. Like the memory quilts, pieces of my history alone do not seem very meaningful, yet tied all together, they present a powerful story of the person that I have become.

This autobiographical writing of my journey to becoming a teacher has been empowering because it has provided me with a lens through which to view my past educational experiences and their relative impact upon my experiences as a teacher and a learner. This journey has provided me with an opportunity to share the role of education in interrupting social reproductive cycles in my life and how I realized my own agency in the process. Much of what is written about teaching is historically removed from teachers and is often presented in a narrow context. In contrast, autobiographical writing is socially and culturally grounded in life history, a fact which enabled me to make connections between my past and the present as a means to continually improve my teaching practices. Autobiography can serve as an effective tool for examining and improving teaching practice because it challenges an individual to consider not only what students bring to the classroom, but also what you, as the teacher bring to the classroom. It is by understanding all facets of oneself as a teacher, a student, and a person that allows the successful building of learning communities that benefit both the students and the teacher. It is in knowing *how* you have become a teacher that you can begin to understand *why*. .

CHAPTER 4

“DARING TO BE EXCELLENT?”

HOW SCHOOL STRUCTURES SHAPE TEACHER AND STUDENT SCHEMA AND PRACTICES.

Urban Magnet seeks to provide a rigorous, enriched curriculum that challenges students intellectually and fosters academic excellence. In addition to implementing innovative teaching techniques, the Urban Magnet staff uses a variety of strategies to enable students to assume responsibility for their education – to plan, design, and assess their work. Urban Magnet respects diverse learning styles and multiple intelligences of its students and strives to nurture the unique talents of each member of the student body. We aspire to be a caring community whose staff, students, and parents value civility, diversity, personal integrity and service to others (Mission Statement, School Handbook, 1999-2000).

Printed on the first page of each student and teacher school handbook, these words give the impression that Urban Magnet provides an idyllic environment in which teachers and students are readily supported in their singular and noble pursuits of teaching and learning. However, as touched upon in chapter 3, during my first year at Urban Magnet I struggled with contradictory school policies and practices that made “daring to be excellent” a greater challenge than I had expected. In this chapter, I more closely examine how school structures both support and contradict the goal of academic excellence for all at Urban Magnet by examining how the larger school culture shapes the practices and beliefs of participants in the school.

4.1 INTRODUCTION

New teachers in urban districts are often assigned positions in the most difficult schools, grades or subjects, even while this practice obviously places both the beginning teacher and their students at a grave disadvantage. Urban Magnet is no exception. In an elite magnet school, where academic success is paramount, one would expect to find highly qualified teachers who are provided with ample physical and human resources to meet their goals. And while out-of-field teaching is commonplace in many urban high schools, it would be an unexpected occurrence where “excellence in teaching” is a school axiom. In the same vein, you would expect a school that places great emphasis on and commitment to maintaining

exceptionally high performance from its students to provide the support necessary to help them excel. Close inspection of the organizational structures at Urban Magnet reveal many contradictory policies and practices that place some teachers and students at a disadvantage. For this reason, it is important to critically examine the school structure in relation to student and teacher agency.

4.2 SCHOOL STRUCTURES AND TEACHER/STUDENT AGENCY

Structure is determined by both the individual and the collective (Sewell, 1992; 1999), meaning many factors (independent of my own beliefs and practices within the classroom) are inherent in structuring the learning environment, and thus, my students' experiences both *with* and *in* science. Because agency is social, meaning no individual exercises agency in isolation from others, it is important to examine the practices and schema of all individuals within the field as each plays a role in co-constructing the structures of that field. In this manner, an individual's agency interacts in a recursive relationship with individual structures as well as those of the collective, (Sewell, 1999). Given that individual and collective agency is both dialectically and recursively interconnected with schema and resources, it is imperative that I examine how the physical and ideological structures established by the school shaped my teaching practices within my classroom and, in turn, my students' experiences in science. This chapter provides a descriptive overview of the cultural and historical context of Urban Magnet by examining how the larger school culture shapes the practices and beliefs of participants in the school. To reveal ways in which school structures can both support and contradict the goal of academic excellence for all at Urban Magnet, this chapter specifically focuses on student and teacher selection, admission to the school, and teacher and student access to and appropriation of resources. Explored at the macro- and meso-level, this description presents both contradictory and coherent aspects of the school culture that shape student and teacher practices in the classroom. In the following three chapters, I turn to micro-level analysis to examine how the science classroom is shaped by these school structure and how these structures afford student and teacher agency in the teaching and learning of science.

4.3 MAGNET SCHOOLS – SELECTING FOR SUCCESS?

4.3.1 *Philadelphia Urban Magnets*

Ranking at the top in a tiered urban school system, magnet schools share few of the same problems as other urban high schools (Neild, 1999). Magnet schools and magnet programs generally have a specific focus for instruction, such as technology or math and science (Oakes, 1990). Students in these schools are generally provided with greater resources, both human and material (Kozol, 1991; Oakes, 1990), and are generally met with high expectations for achievement that are, for the most part, attained by the student body. However, because magnet schools admit students from all areas of the city, their student population is diverse in terms of race, ethnicity, religion, and socioeconomic backgrounds. For this reason, magnet schools must contend with many of the same challenges as other urban schools in an effort to support the diverse needs of their students.

4.3.2 *Urban Magnet – A Brief History*

Urban Magnet is one of five selective admission public magnet schools in Philadelphia, serving students from a cross section of the urban population. The middle school was established in 1958 as a laboratory and demonstration school, envisioning a staff that would experiment with innovative teaching and learning models that would be open to public visitations at any time. Initially the school was racially desegregated, admitting equal numbers of African American and White students with above average ability from all over the city. The high school was added in 1976, admitting only one class of 30 students per year. In 1990, the school was restructured to increase high school enrollment to include four classes, averaging about 100 students per grade. Both the elementary and the high school students are self contained in one five story building. Limited physical space requires that the whole school share many resources, including a small library, an in-door gymnasium, a small auditorium, and a cafeteria.

4.3.3 *The Harvard of High Schools*

Urban Magnet students consistently score higher on standardized tests than any students in the state, including both suburban and private schools throughout Pennsylvania; a feat which has prompted some journalists to refer to Urban Magnet as the “Harvard of High Schools” in local news reports. Urban Magnet is the most

highly ranked school in the district of Philadelphia on the Pennsylvania System of School Assessment (PSSA) exams. The PSSA is administered state wide to students in the fifth, eighth, and eleventh grades for the purpose of providing a standard assessment measure for all districts within the state.

In 2001, Urban Magnet scored higher on the PSSA than all schools in the city, the district, and the state. Table 4.1 represents the PSSA scores in math and reading of Urban Magnet eleventh graders listed in comparison to their peers in two local schools (one magnet and one neighborhood school), the entire district, and the state.

Table 4.1 Grade 11 PSSA Results (2001) – Scaled Score Reports¹²

Schools, district, and state	Math Score	Reading Score
Urban Magnet	1630	1530
Center Magnet	1530	1470
Neighborhood High	1120	1110
School District average	1190	1180
State average	1310	1300

Center Magnet is one of the largest schools in the district and second only to Urban as the highest-achieving select admission school in the district. Students from these schools compete at the city, state, and national level for academic and athletic prizes and scholarships. In the 2001 school year, Urban Magnet students scored modestly higher than Center Magnet students on the PSSA. In contrast, Urban Magnet students score significantly higher than eleventh graders in a local comprehensive high school, Neighborhood High, which is involved in the DUS study. In addition, Urban Magnet students score much higher than students in the district and the state.

The degree to which Urban Magnet students outperform their peers is not fully appreciated as represented by the scaled PSSA scores in Table 4.1. Table 4.2¹³

¹²The results are presented as scaled scores on all PSSA websites and student and school reports. Scaled scores are included because of their ease of interpretation and because they allow comparisons of school results with district and statewide average scaled scores. Scaled scores range from a low of 1000 to a high of 1600.

¹³ See the Pennsylvania Department of Education web site: <http://www.pde.psu.edu/pssa/perflevels.html>. The state defines four levels of achievement: advanced, proficient, basic, and below basic. Advanced is described as “superior academic performance indicating an in-depth understanding and exemplary display of the skills included in Pennsylvania’s Academic Standards.” Below Basic is portrayed as “inadequate academic performance that indicates

provides the percentage of Urban Magnet eleventh graders who achieved one of the following four levels of proficiency as defined by the state: advanced proficiency, proficiency, basic proficiency, and below basic proficiency. In addition, Table 4.2 compares the scores of Urban Magnet students in individual categories in each subject area with eleventh graders from the same two schools, district, and state as were previously introduced in Table 4.1.

Table 4.2 Grade 11 PSSA Results (2001) – Percent of student achievement in each category

Schools, district, and state	% Advanced Proficiency		% Proficiency		% Basic Proficiency		% Below Basic Proficiency	
	Math	Reading	Math	Reading	Math	Reading	Math	Reading
Urban Magnet	86	62	14	38	0	0	0	0
Center Magnet	54	32	39	60	7	8	> 1	> 1
Neighborhood High	1	0	10	15	21	29	68	56
School District	8	7	15	27	20	22	56	44
State	21	16	27	42	22	19	30	23

In comparison with Neighborhood High from the DUS study, where the majority of students scored below basic levels of proficiency¹⁴, Urban Magnet is an obvious exception. In fact, the percentages of students scoring in the highest levels at Urban Magnet and the lowest levels at Neighborhood High are nearly the same – indicating that students are performing as poorly at Neighborhood High as they are performing well at Urban Magnet. And while Neighborhood High boasts scores that are greater than the district average, both of the select admission magnet schools performed well above Neighborhood High, the district, and the state levels. In fact, no Urban Magnet student scored lower than the proficiency level category. In addition, Urban Magnet students excel on nationally administered achievement exams as represented

little understanding and minimal display of the skills included in the Pennsylvania Academic Content Standards. There is a major need for additional instructional opportunities and/or increased student academic commitment to achieve the Proficient Level.”

¹⁴ In 2001, the state proposed that students who did not score proficient in each category would be ineligible for graduation. The policy has since been revoked due to the number of students that would be negatively affected. Starting in the 2003-2004 school year, school district of Philadelphia students will receive a seal on their diplomas indicating levels of proficient or higher and their PSSA scores will appear on their transcripts.

by Table 4. 3 that compares scores from the same schools on the Scholastic Aptitude Test (SAT).

Table 4.3 Scholastic Aptitude Test (SAT) School Year 2000-2001

Schools, district, and state	Math	Verbal	Overall
Urban Magnet	637	628	1265
Center Magnet	548	530	1077
Neighborhood High	349	355	705
School District average	420	416	836
State average	499	500	999

Urban Magnet students excel with an average that is well above that of Center Magnet, the district, and the state and is nearly twice the average score of Neighborhood High. Statistically, Urban Magnet students present a picture of unparalleled achievement. But these scores tell us little about the school, the students, or their teachers.

4.3.4 Urban Magnet Population

Urban Magnet serves a student population drawn from all over the city, thus providing a larger variety of race, ethnicity, and economic backgrounds than can be found in most Philadelphia neighborhood schools. In 2001 there were 1,154 students enrolled in grades 5 through 12, in 36 homerooms. According to school district reports (SDP, 2003) for the 2001-2002 school year, Urban Magnet's enrollment by race was 52% White, 34% African American, 9% Asian, 4% Latino, and 1% other. While information about enrollment for the middle school separate from the high school is unavailable on the website, school records¹⁵ indicate there is much less racial diversity within the high school. The high school admission list for the 2002 school year indicates that fewer Black eighth grade students were accepted (45%) to the high school in comparison to their White peers (67%) even while there are approximately the same percentages of Black and White students in the eighth grade (40% and 48% respectively). Black students who were accepted were generally

¹⁵ As a teacher at Urban Magnet, I gained access to statistical information including race and gender for eighth grade acceptance and enrollment. This information was useful in determining the racial breakdown of the incoming high school class in comparison to the statistical information provided for the whole school on the School District of Philadelphia website.

female. In the 2001-2002 school year, there were only six Black male students (representing 6% of their class¹⁶) in the entire tenth grade. Interestingly 71% of all Asian students were retained for the high school while only 31% of Latino students were accepted.

More racially diverse than many other high schools in the city, Urban Magnet students tend to be less economically disadvantaged than students at these neighborhood high schools. According to the SDP website (2003), Urban Magnet students reported as being low income was 39% compared to the district's 72% and the state's 31%. Again, these data are unavailable for the middle school and high school individually, but following national statistics that links race and socioeconomic class in urban schools, a decrease in minority student representation would correlate to an increase in overall socioeconomic status the high school. Thus, the student population at Urban Magnet high school tends to be somewhat less diverse than the middle school both racially and economically.

4.3.5 Student Selection

Students are selected for admission¹⁷ to the fifth grade based on academic records from third grade; however, there are some instances in which students are accepted in sixth, seventh, and eighth grades. Students must score in at least the 88th percentile on the Stanford Achievement Test Series, Ninth Edition, (Stanford 9)¹⁸ or a similar nationally recognized test in order to apply. The SDP website (2003) indicates that while the 88th percentile is the cut off, scores must usually be higher for admission but that a lower reading score may be considered for students who have lived in the United States for less than three years. Additionally, students must have all A's or B's on their report cards, student behavior grades should not be less than a B, and attendance and punctuality are also considered in the admissions process.

¹⁶ In interviews with students concerning how they feel about the lack of minority presence in the high school, some students offered that while some of their minority friends were accepted to Urban Magnet, many chose to attend other select admission schools because they offer a more diverse student population and more athletic and club possibilities which are needed for college applications.

¹⁷ Information pertaining to student selection and admission procedures is taken from a school-printed teacher's manual that is provided at the beginning of each year. This information is also available in a similar format on the school district web page.

¹⁸ The SAT-9 is a standardized exam used district-wide to compare school achievement levels within the district. In 2002, the SAT-9 was replaced by a newly developed standardized exam called the Terra Nova.

The high school is described in the High School Resource Book (2003), distributed by the school district, as being composed of students with “unusual abilities whom are exclusively selected from those who have attended Urban Magnet prior to ninth grade.” Once accepted to the school, all students take the same courses in grades 5-8 but must then reapply for admission to the high school based on their performance in their seventh grade year. Performance factors include grades, behavior, attendance, and teacher recommendation. From the middle school applicants, only one half of the students are chosen for the high school, limiting high school enrollment to about 100 - 110 students per grade. The remaining students must apply to other area magnet schools for admission or they return to their local neighborhood schools. Since a large number of students are applying for a limited number of spaces in the high school, students at Urban Magnet tend to be highly competitive.

4.3.6 The Achievement Gap at Urban Magnet

The diverse population at Urban Magnet is particularly problematic in that the student population is selected from throughout the city, with middle school students coming from suburban, private, charter, and neighborhood elementary schools. It is reasonable to assume, based on the inequitable distribution of resources in these schools that student achievement at Urban Magnet could be greatly impacted by their previous educational experiences in these different schools. Oakes (1990) reports that students who attend schools with greater resources but that are from lower socioeconomic backgrounds still perform poorly in comparison to their peers from high socioeconomic backgrounds within the same setting. Stacy Olitsky and Linda Loman (2003) confirmed this finding through their DUS research in which they investigated ways to improve achievement in science in an eighth grade science classroom at Urban Magnet. Stacey and Linda focused their attention on students in Linda’s eighth grade science classes and found evidence for an achievement gap among Urban Magnet students of differing racial, ethnic, and socioeconomic backgrounds. That so many students experience failure and low-achievement at Urban Magnet is surprising considering the reputation of and expectation for “excellence” for all. To understand how and why this achievement difference exists among some Urban Magnet students and not others requires a closer examination of the school structures that shape the experiences of this school community.

In the following sections, I frame the social and historical context of my experiences at Urban Magnet by highlighting the following constructions as they contribute to the school structure: hiring policies, rostering procedures, curriculum assignment, and teacher and student support policies. Although this chapter focuses primarily on structures as they affect teacher access and appropriation to resources, I briefly consider how the practices and schema I developed in the field of the school shape the structure of my classroom and how that structure affords or truncates student agency. In subsequent chapters, I examine how these classroom structures can be transformed as a result of capital exchanges (e.g., through cogenerative dialogues) to afford greater individual and collective agency.

4.4 NAVIGATING SCHOOL STRUCTURES (AND GETTING LOST)

4.4.1 School Organization

Urban Magnet is organized into two “houses,” a middle school and a high school, each with its own administrative structures that are overseen by one principal and two vice principals. Administrative decisions are made by the principal and are then disseminated to the staff via the vice principals and the “house” managers for each grade. Both the hiring and curriculum assignments are controlled solely by the principal, leaving all discipline issues and other tasks to the vice principals. The “roster room” is located in the main office from which the roster staff makes all the scheduling decisions concerning room assignments, daily rosters, and preparatory coverage (in the event that a substitute is not retained for teacher absence). This staff is composed of two teachers (both physical education instructors and coaches) who have a split assignment between their roster duties and teaching one or two classes per day. Communication between these three administrative offices (principal, vice principals, and roster room) is sometimes poor, resulting in fragmented and problematic decision-making.

4.4.2 Hiring Policy: In Through the Back Door

Because Urban Magnet is characterized as a demonstration school within the district, teachers employed by the school are required to have successfully taught for at least three years in order to apply for the demonstration exam. The exam consists of teaching a lesson from a prescribed topic to a class of students in the presence of a high school principal and a district official. Afterwards, the applicants’ name is

placed on a Demonstration School Eligibility list (in chronological order according to completion of test date) from which principals may choose teachers to offer a transfer to their school. At Urban Magnet, very few teachers are hired using this method. In my case, a Biology position opened in the spring of my first year at Dewey. The principal called me to ask if I was interested in teaching at the high school level, explaining that I would be admitted to the school as a “special appointment” for a one-year term that would be re-negotiated at the end of the year.

The structures associated with the hiring practices at Urban Magnet are central to the positioning of new teachers within in the school. First, because Urban Magnet is an elite school, there is a sense that one should feel privileged to work there. This was especially true considering I knew I had been hired “illegally” (by district standards for appointment to a Demonstration school) because I lacked the credentials needed to even qualify for the exam. Second, because the position was a “special appointment” that needed to be re-allocated on a yearly basis, as a new teacher, I was aware that my employment was provisional. This fact greatly diminished my agency during my first year as I was very reluctant to disagree with the administration or the parents for fear that I would not be re-employed at Urban Magnet the following year.

Having “come through the backdoor,” I was conscious that the rules that protected other district employees did not necessarily apply to Urban Magnet; it was tacitly implied that the district was aware of these special hiring practices and had quietly sanctioned them in the interest of maintaining a select teaching staff. Such practices insured that non-tenured teachers infrequently voiced malcontent to the administration concerning the inequitable distribution of resources among the staff and the lack of support networks for new hires. However, teachers often complained to one another about these issues, noting that some teachers enjoyed disproportionate access to school funds for purchasing resource materials for their classrooms. Colleagues explained that the more prizes students won at a competition, such as the science fair or in an art contest, the more monetary support the teacher of those students would receive to support student participation in such activities.

Administrative support of teachers and students who excel at Urban Magnet is representative of a common practice of publicly rewarding achievements that reflect well on the school. Contrary to the school’s commitment to academic excellence,

students and teachers who struggle are not provided physical and material resources to support their teaching and learning. Furthermore, a more insidious by-product of this practice is that it reinforces the hegemonic achievement ideology that everyone has an equal opportunity to succeed when only successes are celebrated and struggles are ignored. This practice discourages students and teachers from seeking the extra support they may need, thereby preventing them from accessing the resources that they require to succeed.

4.4.3 Rostering Procedures: Floating Out of Control

Because Urban Magnet was originally built to house only a fraction of the students it currently serves, very few high school teachers are permanently assigned to a classroom. Consequently, all first year teachers at Urban Magnet are required to “float”, meaning they have no one room in which to teach, so they must float for all of their classes. As a floater, my classes were scheduled to meet in different rooms all over the school, meaning first period I might teach in the basement and then teach on the fifth floor the next period. All of my classes were scheduled to meet at different times each day of the week (e.g., my Chemistry class met first period one day and eighth period the next day) and few of my classes met consecutively in the same room. This prevented me from offering labs that required any set-up prior to class and necessitated that all labs be completed in one 50-minute period, thus severely limiting the types of activities I could offer students.

Floating is not necessarily problematic for teachers who have fewer supplies (like math or English teachers), but for a science teacher, moving to a different classroom each period is very challenging. Because only three classrooms at Urban Magnet are equipped with both running water and gas, they are in high demand for science teachers. One would reasonably expect that science teachers would be rostered into these rooms, and while priority assignment was often given to more veteran science teachers, non-science faculty were also rostered into these classes. This is because rostering practices at Urban Magnet are more political than practical. As a first year teacher, I was rostered to teach Physical Science in the cafeteria while the French teacher was assigned to one of the science classrooms. Classroom assignments were often based on whom you knew, not what you taught.

Equity issues such as those described above may have been avoided if those in charge of the schedule were science teachers or were provided input by other “teaching” staff. Teacher curriculum assignments and scheduling practices reveal several clear contradictions in the school’s ideological structure that promote an image of “excellence in teaching” without providing the requisite tools to achieve at such a high standard. However, teachers were not the only ones who had to contend with inequitable resources while being expected to succeed at Urban Magnet as many students struggled with and against school structures as well.

4.4.4 Cream of the Crop

Welcome to Urban Magnet. You are all here because you have out-performed all your peers. You are the best of the best, the cream of the crop, and now you are here, at Urban Magnet! (Principal’s Speech, September 2001).

These are the words that greet the new nine and ten-year-old Urban Magnet 5th graders and their parents on their first day of school at the 5th grade assembly. The students and their parents are introduced to the many great academic, athletic, and artistic accomplishments of their more senior classmates with the expectation that they too will succeed and accomplish great feats in their careers at Urban Magnet. These students are indeed the “cream of the crop,” and many are the best that their neighborhood schools have to offer. They performed well on standardized tests, and had glowing recommendations from their teachers and community leaders. These children, energetic and enthusiastic to learn, have been recognized as the top of their class and have gained access to Urban Magnet for their achievements. Yet, for many of these students, the reality of being number one in a class of 33 would soon change as they found that in every class, there has to be someone in last place if there is to be someone in first.

4.4.5 Struggling to Succeed

The transition from Neighborhood Elementary School to Urban Magnet is very difficult for many students. This transition is especially difficult for minority and poor students who lack the resources enjoyed by many of their peers (with whom they are competing). Using Sewell’s (1992; 1999) theoretical framework, it is important to recognize that a student’s inability to access material resources (calculators, books, and computers) are not the only limiting factors that mediate

success at Urban Magnet. As Rowhea Elmesky (2001) explains structure is “schemas and sets of resources that mutually sustain each other to either empower or constrain social/cultural actions.” The following transcript highlights a structure created by the school, premised upon an ideology of meritocracy and achievement, that does not necessarily support the practices of all students.

It seemed like I could never keep up. I always needed something for a poster or a book or a project. My moms¹⁹ worked two jobs and was never home when I was. I was not allowed to go out after she left [for work], so I could only get supplies on the weekend. Teachers was always assigning something on Tuesday due for Friday – so ‘cause of my situation, I was never on time. (Chandra, Audiotaped Interview, November 2001).

While the ideology of the school promoted a belief that all students should be successful at Urban Magnet, Chandra’s experiences and the experience of many of her peers who were also poor minorities were contradictory to the structures set up by the school. As a student teacher, unfamiliar with the ideology of the school, I too noticed the contradictory policies and practices adopted by the 5th grade teachers with whom I worked regarding project assignments and assessment. The following excerpt from my student teaching journal expresses some of the frustration I felt concerning the disparity in the quality of work produced by the different students in our classes.

I am overwhelmed by the blatant disadvantages that some students are asked to overcome in order to “succeed” at Urban Magnet. With the exception of my science co-operating teacher, no one else seems to notice or care that many of the students in their classes are struggling to compete with their peers who have unfair advantages, like parents with advanced degrees or even stuff like computers and calculators. The difference in academic preparation is apparent after only the first few weeks when students from the neighborhood schools begin to struggle with the amount of work assigned and the constant barrage of tests and special projects. Ms. Carol’s comment, “Look around you Ms. Martin. I can tell you right now which of these babies will make it into the high school and which will not” still haunts me. (Student Teaching Journal, January 1998).

Four years later, while working as both a middle and high school science teacher at Urban Magnet, I found Ms. Carol’s predictions about which students would be accepted to the high school to be quite accurate as many of the neighborhood

¹⁹ Written and transcribed student comments are not corrected for grammar to preserve authenticity.

students from our 5th grade class were rejected from the high school as eighth graders.

4.4.6 Those Loud Black Kids: Cultural Incongruence and Others

From the beginning of their careers at Urban Magnet, many neighborhood students must play double time to just stay afloat. Often we see students, who are struggling academically, becoming more and more frustrated with themselves, their peers, and the school. For this reason, some students begin to act out, becoming labeled as behavior problems. Urban Magnet middle school teachers routinely give these students low marks in behavior, making them ineligible to even apply for acceptance to the high school. Being labeled a “behavior problem” at Urban Magnet is significant. Teachers and students often ridicule students identified as troublemakers as “not belonging” at Urban Magnet. That a disproportionate number of these students are minorities, and Black males especially may play an important role in determining the lack of diversity in the high school.

In a school where over 90% of the entire staff is White, students of color are almost always in the position of Other (racially and often economically) from all authority figures. Teachers who are racially different from their students and who have limited interactions with these students outside the field of the classroom may have a limited understanding of the dispositional practices minority students may enact in other fields, such as the hallway. On more than one occasion, my students and I have overheard other teachers whispering in the halls about those “loud Black kids.” Unfamiliar with the cultural dispositions of minority students, White teachers often view the behavior, dress, and interaction styles of these students as deviant. The same styles and behaviors exhibited by White students who are not viewed as Other, are perceived differently in comparison. Comments based on racial/cultural difference were not only directed at Black students, as Asian students were stereotyped as model minorities (Lee, 1996); students who are expected to be quiet, well behaved, and academically successful, particularly in math and science. Therefore, when Asian student behavior contradicted this stereotype, students were scolded for not behaving “like good Asians.” In addition, many of these students reported that teachers questioned their poor performance in math, with comments such as, “but you’re supposed to be good in math, why are you failing?”

While racial Otherness is easily distinguishable, cultural incongruence is not always visible as many students may be positioned as Other due to class. In a survey given to students at the end of their junior year, students were asked to reflect on their experiences in our Chemistry class the previous year in comparison to their experiences in Physics. Data collected from an open-ended question on this survey asked students to consider the eighth grade selection process and how that process affected their sense of “belonging” to Urban Magnet throughout their high school career.

A lot of people did not get into the high school. A lot of times throughout the course of high school, I would compare myself to “smarter” kids and ask myself, “Why am I here?” or “How did I get accepted into this school?” Not feeling “smart enough” can make one feel out of place at Magnet, but being poor can mean your really are out of place. (Sara, Reflecting on Urban Magnet Survey, September 2003).

A self-proclaimed Other, Sara has often felt out of place at Urban Magnet. As her advisor, I frequently spoke with her teachers about her academic progress and I was often met with comments such as, “Sara fails to live up to her potential” or “ she just doesn’t apply herself.” Unlike Chandra who is Black, Sara’s blue eyes and long blond hair do not automatically position her as Other in relation to her teachers and most of her classmates. Because her Otherness was invisible to most, Sara’s teachers interpreted her academic struggle as laziness. Feeling like an “admission’s mistake”, Sara (and her parents) lacked the sense of entitlement that would allow her to seek help or to raise issue with unfair classroom practices that routinely placed Sarah at a disadvantage in relation to her more affluent peers.

Because appearance is an important marker for determining characteristics that position someone as “Other,” assumptions teachers and students have about one another can shape their practices in relation to one another. Unconscious assumptions I held about Sara due to her physical appearance (White) and dress (fashionable clothes) prevented me from considering that some aspects of Sara’s homelife made it difficult for her to “succeed” at Urban Magnet. Believing that minority students were at a greater disadvantage at Urban Magnet, I never questioned why Sara struggled so much in my chemistry class. The following

vignette from Sara's video ethnography²⁰ of her life forced me to reconsider my assumptions about student access to resources based on race and dress.

Sara lives in a cramped row-home in very poor area of the city known as Kensington. Sara's mother works three nights a week until 10 pm, leaving her solely responsible for the welfare of her cousin who lives as a foster child in Sara's mothers' care. Holding the camera in one hand or leaving the camera on a tripod, Sara gives us a peek into a "day in her life," as she picks up her two-year-old cousin from day care, carries her home, feeds and bathes her and then attempts to do her homework. Sara has no desk or area in which to work and is constantly interrupted by her cousin for television, play, hunger, diaper changes and attention. Exhausted, she turns the camera off at midnight after she has only half completed her homework for her four classes, including chemistry. She has five hours to sleep before she is expected to ready her cousin for daycare and herself for school as her mother has an early shift the next day (Sara video ethnography, May 2002).

I had been Sara's advisor for two years and had been teaching her for nearly nine months before viewing her completed video ethnography. Prior to this, I shared the same view as many of her other teachers, assuming she was unsuccessful because she was "simply not applying herself." I knew Sara had a young child in her home and that she lived North of the school, but I had no idea how these "facts" translated into what she experienced as her daily existence. What I *knew* for certain was that Sara was quiet, self-doubting, uncomfortable with math, and not what I considered to be a very *good* student in chemistry.

Viewing Sara's ethnography made clear that the perception of Otherness is socially and historically constituted as I discovered that Sara's class status was clearly defined for those familiar with the area due to her regional accent. While many students at Urban Magnet have accents, Sara's accent is representative of a particular area of the city associated with high levels of poverty. Unfamiliar with the city, I missed the social/cultural marker that distinguished Sara as Other for some of her teachers and her peers, preventing me from recognizing how some of my teaching practices failed to support her learning. In the next two chapters, I revisit this issue in greater detail when I examine the importance of cogenerative dialogue with students like Sara in providing both me with opportunities to discuss classroom structures that prevented Sara from performing as well as some of her peers.

²⁰ Students were provided with video cameras and asked to film their lives outside of school. Students were encouraged to consider how/if chemistry played a role in their everyday lives. Students shared these ethnographies at a "film-festival" and the end of the school year.

4.4.7 Teacher as the Other Culture

The problem of cultural otherness is not exclusive to teachers' perceptions of students, but also teacher perceptions of their peers (other teachers) and student perceptions of their teachers. At Urban Magnet, both teachers and students often discriminated against minority teachers. Of the five minority teachers at Urban Magnet, only two taught in the high school and both were in the science department. Mr. Lo, who is Chinese immigrant, teaches Physics and Dr. Tamal, who is Sri Lankan immigrant, teaches Chemistry.

The discrimination faced by teachers, as adults, was more blatant. Upon inviting Mr. Lo to have lunch with me in the faculty lounge, he declined saying he was asked not to eat in the lounge because his "Chinese food would stink up the room." On more than one occasion, I overheard other faculty members *teasingly* ask Mr. Lo what "strange food" he had brought from home and I once heard a colleague ask if he was eating dog! Additionally, teachers and administrators often made fun of Mr. Lo and Dr. Tamal's accents – imitating their voices in front of teachers and students alike.

By confronting these teachers and addressing the racism inherent in their remarks, I was labeled as "over reactionary" or told that I was being "too race conscious" and was reminded these comments were for "laughs only." In fact, my reaction elicited increased comments and "jokes" about my *own* Southern accent and working-class roots. That such practices were tacitly accepted and approved by so many served to silence all of us for fear of being further isolated and ostracized by our Otherness – resulting in even more disparate access to resources. The discriminatory practices of some faculty and administration served as a schematic resource for other teachers and students, thereby, reinforcing these practices and their acceptance by the students and teachers they oppressed, silencing any possibility of a dialogue about the experiences of cultural Others at Urban Magnet.

4.5 DARE TO BE FRIENDS: THE IMPORTANCE OF PEER SUPPORT IN TEACHING

Unable to successfully navigate the ideological and physical structures of the school (and unwilling to involve the administration), I sought help from my peers. However, many of the structural limitations described above harmed teacher relations in the building, making it difficult to build the social networks required to gain the capital

teachers in this school valued. In addition, feelings of alienation from the administration and a general sense of disenfranchisement negatively influenced my self-perceptions as a community member in the school. The lack of organization in the school and the science department resulted in a “look out for yourself” attitude among many teachers. Recognizing that building relationships with other teachers was crucial if my effort to access and appropriate much needed resources (both human and material) was to be successful, I attempted to reach out.

4.5.1 The New Kid in Town

Cultural sociology recognizes that as individuals act within the world, they interact with the structure of that field. To be agentic within a field, an individual must possess the social and symbolic capital that field enables them to access and appropriate the resources needed to afford their agency. Capital exchanges occur while participating with others within a field, meaning the accumulation of capital is historically and socially constituted. Thus being a new teacher (or student) at any school is difficult because capital exchanges require that time is spent participating with others in that field over time. In the following sections, I examine the ways in which my capital as a new teacher shaped my agency, and thus, my teaching practices and social interactions with my peers and students at Urban Magnet.

As a new teacher, I had the least social and symbolic capital in the science department (which consisted of five teachers), positioning me as the lowest person on the totem pole. Status is a form of symbolic capital. A new teacher may command symbolic capital with their peers (and students) based on their teaching credentials, certification, educational background, and/or teaching experience. Although I had two degrees from well-respected area schools, I had only one year of teaching experience while my peers had all taught science at Urban Magnet for 10 to 20 years. Though my education background gained me some symbolic capital, my lack of teaching experience, which was more highly valued by my fellow teachers, diminished this capital. In addition, I was hired without the minimum three years experience required of magnet school hires. Accordingly, among my peers I was not respected as a science teacher.

Symbolic capital, if valued within a field, can be used to gain social capital with others. Very aware of my “outsider” status, I actively sought ways to make inroads

with my peers. Fortunately, I was not a complete outsider as I had student-taught Biology (for three weeks) with the science department chair who was also one of the most senior faculty members in the school. She had a reputation for being a very stern, strict teacher and she enjoyed that students (and administrators) called her the “Dragon Lady.” As her student-teacher, she had encouraged me to be firm with my classes, bragging to students that she was preening a new “Little Dragon Lady” after her own example. While I was more than a little intimidated by her, as a guest in her classroom, I was eager to appease her – hoping to gain social capital that would benefit me in other fields, such as the teacher lounge.

Having spent the last year in a “tough neighborhood school” earned me a great deal of symbolic capital with the two most senior science faculty members because the quality they most respected in a teacher was an ability to maintain classroom control. Although they knew little about my teaching abilities, they were impressed I had lasted a full year at Dewey. They both felt content knowledge could be learned, but the ability to control a class was crucial and could not be learned. They commented that if I could handle myself at Dewey, I would find the students at Urban Magnet posed no challenge.

Having heard several teachers in the school openly scorn Mr. Lo for his inability to control his students, I desperately wanted to make a good impression for fear that I would be compared to him. Peer perception that Mr. Lo was incapable of controlling his classes negatively affected his teaching at Urban Magnet by greatly reducing his access to science materials because the other science teachers were afraid he would allow students to destroy or lose already scarce resources. Even while it was widely acknowledged by student and staff alike that Mr. Lo was very knowledgeable about Physics – he was considered incompetent as a teacher, and as such, was ignored and avoided by many teachers in the school – resulting in a near complete isolation from material and human resources.

This revelation was salient in that it clearly demonstrated to me the importance of the perceptions of others. My obvious struggles at Dewey to maintain any semblance of classroom order (much like Mr. Lo) resulted in the provision of excess resources – including human resources (my principal, other teachers, aides) and material resources (extra science equipment, books, etc). At Urban Magnet, if teachers and/or

administrators perceived a teacher to be struggling, his or her ability to access human and material resources (including science equipment, funds, and room assignments) was negatively affected. Yet another contradiction in the administrative policies of the school is evidenced when rather than support a teacher (or student) who struggles, support is withheld, establishing a “sink or swim” mentality. This creates a climate in which it is difficult for students and teachers to ask for help when needed, thus diminishing student and teacher agency.

4.5.2 The Little Dragon Lady: Constructing a Teacher Identity

Similar to my experiences at Dewey, the administration and staff at Urban Magnet valued teachers who could control their students. The contradiction I experienced at Urban Magnet was that I had imagined higher expectations would be placed on teachers to provide rigorous, academic programs, but I found that how one’s classes *looked* to the outside eye was more important than what was being *taught* in the classroom. This belief was reinforced by school policies that rewarded teachers and students who appeared to be successful (quiet classrooms) while at the same time ignoring or penalizing those who did not fit the mold of what school administrators valued. Judged by these standards, I was deemed a very successful teacher at Urban Magnet during my first week of school because I controlled student behavior very well, thus gaining a great deal of social capital among my teacher colleagues and the administration.

The respect I gained from my peers as being a tough teacher earned me symbolic capital in the form of respect and status as a certain type of teacher who was valued in the school and in the science department. The positive feedback I received from the department head and other teachers served to reinforce my practices as a strict disciplinarian in the classroom. In addition to the positive reinforcement I received, I was keenly aware of how students and staff continued to treat Mr. Lo due to his inability to control his classes – urging me to distance myself from this image as an inept teacher as much as possible.

After all of the student behavior problems I had encountered at Dewey, I was relieved that I no longer required help from other teachers to quiet my classes. At Urban Magnet, students fell silent when I walked into the room – this was in stark contrast to my experiences at Dewey where both parents and students constantly

urged me to “be meaner” in order to “get kids quiet.” I found that students at Urban Magnet also held strict teachers in high regard. Consequently, I gained a lot of symbolic capital with students as a teacher who would not allow students to “get over” on me. In the following interview, Sarah-Kate asked two students from my senior Advanced Biology class to recall their first encounter with me two years earlier as their 10th grade Chemistry teacher.

Well the first thing, she tried to come off a little intimidating. She was, like... there was a rumor that since she was taken under the wing of the Dragon Lady, and that she had picked up some rough habits. We knew she meant business. (Student Interview, March 2002).

Like she was very strict, like if you did something wrong, she would be on top of you right away. Um... she was definitely a regimented type of teacher. I remember she would always give this one boy detention like everyday. It was like she had to make sure no one thought she was soft, ‘cause kids would take advantage as a new teacher (Student Interview, March 2002).

Unlike at Dewey, I had very little support from the faculty and administration so I resolved to “handle” all behavior problems myself. Determined to control behavior issues that had been of great importance at Dewey, such as talking, sharpening pencils, and being late to class – I developed elaborate point systems connecting these issues to behavior marks at Urban Magnet. As mentioned earlier, behavior grades can prevent students from being accepted into the high school or from consideration for academic honors and participation in social and club activities. Rules regulating late work, bathroom passes, talking while I was talking, etc. were enforced with zeal because as a young, inexperienced, and uncertified chemistry teacher, I was very concerned that I would “lose control” of my classes at any moment. Thus, my preconceptions about student behavior, as developed at Dewey, shaped the classroom structure. The students’ beliefs about new and inexperienced teachers shaped their dispositions to act in certain ways, supporting a cycle of negative emotional energy (Collins, 2004) and cultural incongruence resulting in a contentious and non-cohesive learning environment that was characteristic of my classes during my first few months at Urban Magnet.

Feeling pressured to meet the expectations of my peers, to live up to my title of Little Dragon Lady, and to avoid the humiliating experiences of my first days at Dewey, I both consciously and unconsciously assumed a set of practices that were not my

own. These experiences were influential in the construction of my identity as a teacher who must “control” my classes in order to teach. While conflicting for me on a personal level, especially with regards to how I initially became positioned in relation to my students, I believed it was more important for me to gain (and maintain) social and symbolic capital with my peers rather than with my students. I initially viewed my peers as more valuable than my students in helping me gain access to the resources I needed to support my teaching, but after a few months struggling to “fit-in” with members of the science faculty, I came to the realization that my greatest resource was already within my reach – my students. These experiences with an unsupportive staff forced me to seek help from the students in my classes to access the resources we needed to learn science, thus engendering a practice of collaboration with students that became an important resource for my involvement with students as researchers during our involvement in the DUS project.

4.5.3 Curriculum Assignments: A Political Bombshell

Even though Urban Magnet housed grades 5-12, there was no real community established among teachers across grades. Certified to teach both elementary and secondary subjects, I had opportunities to interact with teachers in both schools. I found that elementary teachers generally felt unappreciated by both the administration and their peers in the high school and were often made to feel inadequate in comparison because they taught “less rigorous” subject matter. Because teaching in the high school was considered a higher status position, being assigned to teach middle school science was seen as a punishment by some of the high school teachers. Even so, it was not uncommon for teachers certified in Biology or Physics to be assigned seventh grade Life science or eighth grade Physical and Earth science classes as administrators generally expected high school teachers to teach the same subjects in the middle school. There were some exceptions as teachers with more seniority (and social and symbolic capital) were able to avoid such assignments, but Mr. Lo was routinely assigned to teach in both the high school and the middle school.

As a new teacher, I was also assigned two middle school science classes (Physical and Earth Science) and two high school classes (Biology and Chemistry). Technically, both eighth grade courses were covered by my elementary certification,

leaving only chemistry as a true “out-of-field” teaching assignment. In reality, my previous teaching experiences had left me unprepared for any of these courses, but chemistry proved to be the most difficult. In our science department, there were three Biology teachers (including me) in addition to Mr. Lo and Dr. Tamal. An administrative decision to assign me a chemistry class necessitated that Dr. Tamal, a senior teacher, be assigned to teach in the middle school for the first time in her 11 years at the school. New to the school, I was unaware of the political nature of Dr. Tamal’s assignment, and was therefore unprepared to deal with the fallout from the bombshell the administration dropped on the science department.

4.5.4 Isolation in the Out-field

Viewed as an embarrassing reminder of a very public demotion, Dr. Tamal, unable to express her frustration to the administration, turned her anger towards me. Led by the principal to believe that Dr. Tamal eagerly awaited my call, I phoned Dr. Tamal during the summer to inquire about textbooks and to collaborate with her on my chemistry syllabus.

After I introduced myself, Dr. Tamal asked where I had gotten her number. I told her the principal had suggested I call. She informed me I was rude to call her at home during the summer and to never do so again. She hung up very abruptly. I was stunned and very confused. (Sonya Interview with Sarah-Kate, January 2002).

My first encounter with Dr. Tamal is representative of our relationship over the next three years. Although unpleasant to endure, the more I learned about the culture of the school and the more I examined the structures set in place by the administration, the more understandable were her frustration and anger. The ideological structures established by the school shaped the availability of resources for me as an unwelcome newcomer to the science department. Without chemistry certification and being relatively inexperienced as a teacher, I lacked the symbolic capital that would have allowed Dr. Tamal to accept me as an equal, making my assignment to teach chemistry less threatening. Because the biology teachers (and Mr. Lo) had always been required to teach in the middle school, my addition did not threaten their status in the school in the same way it had Dr. Tamal’s. As a result, both biology teachers and Mr. Lo were available as human resources and would share material

resources when available. Unfortunately, this was not the case with Dr. Tamal and the teachers and staff members (such as the lab technician) who “sided” with her.

All of the materials and resources were locked away in Dr. Tamal’s classroom. She was the only one who had a key to her room and would lock it at night so I couldn’t get access to any of her things. Even the cleaning staff did not have a key. When I wanted to use something I had to go to Dr. Tamal and ask politely if I could borrow it. If she thought that I wouldn’t be able to handle using the equipment or materials, she wouldn’t let me borrow it (Sonya Interview with Sarah-Kate, January, 2002).

Providing no incentive for establishing a cohesive science department with centralized equipment and material storage, the administration permitted teachers to hoard materials individually in their rooms (and because none of these teachers floated, they had easy access to their materials at all times). In addition, the administration allocated funds to teachers individually to purchase materials for their classes. Teachers were allotted these funds each semester, therefore, over time, they were able to establish a cache of materials and equipment that they were not obliged to share. Because Dr. Tamal was the only other chemistry teacher, she was solely responsible for the procuring of all chemistry related resources (including textbooks). Such practices, both established and supported by the administration, incited a power struggle between Dr. Tamal and me over the material resources I needed to teach chemistry. Unable to gain access to these resources, the principal chose to purchase a separate set of materials to equip my classes rather than encourage equitable sharing among the staff – thus reinforcing the divide within the science department with her polarizing policies²¹.

The principal’s decision to provide me with these material resources precariously positioned me with respect to the other science teachers and the entire staff who all needed extra supplies, thus making my transition into the school even more difficult. Seen as a coup by students and parents (and some teachers outside the science department), my ability to navigate the school structures and successfully obtain new materials for my classes gained me symbolic capital (as a teacher “worthy” of

²¹ The principal’s actions are consistent with district practices as the Philadelphia school district (like many urban districts) have chosen to abolish specialized departments in favor of Small Learning Communities, or SLCs (Milne, 2003). Due to Urban Magnet’s small size, the SLC encompassed the whole high school, placing one person in charge of the High School “house” as they are referred to at Urban Magnet. The delocalization of departments was associated with a loss of department heads who once served as the point person for ordering, organizing, and maintaining departmental materials and equipment. This trend reinforced an ideology of “looking out for your own interests.”

receiving these materials) while simultaneously losing social capital with teachers who had long needed support without receiving it. Viewed by many teachers as yet another example of inequity in resource distribution, some became more territorial of the resources they had available to them (such as their rooms) in an effort to maintain control over a situation in which they felt they had little control. This resulted in isolating me from my peers in ways that further complicated my access to resources and caused more tension between me and the teachers into whose rooms I floated.

4.5.5 Teacher Support? Sinking While Floating

In the following transcript from a cogenerative dialogue with Sarah-Kate (January, 2002), we discussed some of the difficulties I experienced as a floater during my first months and problems I was still encountering in my third year.

S.K.: So you seemed pretty irritated today after class with the chair situation in room 408. Can you explain what was going on?

S.M.: Well, [the Biology teacher] had come by earlier in the day to speak to me about my last period class. You know, the 8th graders? He said the chairs and tables are not in order at the end of the day, so he has to go around in the morning to straighten them out, so he wants me to take care of that.

S.K.: Well, the room looked pretty good to me.

S.M.: Yeah, well, he wants each chair pushed in and all of the tables to be lined up to a piece of tape he has on the floor. I always make sure they pick up their trash and close the windows, but we are always in such a rush! I mean I have a hard enough time just remembering where class is sometimes without being worried about tape on the floor. At any rate, he can get pretty nasty. Unfortunately that can translate into me being crotchety with the kids.

S.K.: Is he the only one you have problems with?

S.M.: Oh, no! My first year, I had a class in Dr. Tamal's chemistry class on the third floor. During the first week, one day after my class, she telephones me in the basement to tell me I need to come back up and erase her chalkboard so she could start her class!

S.K.: Are you serious? What did you do?

S.M.: I told her I was sorry but I was starting class and she would have to erase the board herself and I hung up. I mean, can you imagine the time she spent

tracking me down to call and ask that? Anyway, my kids overheard the conversation and could not believe she had asked that. So when she called back a few minutes later to tell me she was still waiting, I started to tell her she could wait all day, but one of my kids volunteered to go erase the board. It was horrible. It was like that all year, so the next year, I requested to never be rostered into her room again!

Seen as a nuisance by senior teachers in the school, floaters are often reminded that they are, in someone else's room, and as such, have limited control of the classroom in terms of desk arrangement, organization of materials, and space for storage of materials. Teachers with a great deal of symbolic capital (such as senior teachers or department heads) as well as those with social capital with the roster room staff, were able to exert some control over which teachers "floated" in and out of their rooms. In the same respect, these senior teachers were rarely assigned a substitute coverage as the roster staff generally pawned these off to new teachers or teachers with little social and symbolic capital in the school (for example, Mr. Lo was assigned a class coverage nearly everyday – something that would never happen to Dr. Tamal or a teacher in the same department as the roster staff). As the year progressed, I learned that while some teachers, like Dr. Tamal, ruled the physical domain of their classroom, it was the roster staff that bestowed them their power.

4.5.6 Social Capital – A Life Preserver for Floaters

The nomadic structure associated with floating made it difficult for me to build relationships with other teachers, thus limiting my ability to build social capital and to gain cultural capital in the form of pedagogical and content knowledge from more experienced teachers. In an effort to socialize with teachers outside of the science department, I began to attend various events after school. One teacher suggested I attend sporting events as a way to meet parents and students *and* as a way to gain social capital with students by supporting them in activities outside of school. While significant on many levels, my decision to attend student games after school provided me with opportunities to socialize with the roster staff. Poorly attended by staff and students, my appearance at these games did not go unnoticed by student athletes and their parents. Being the only staff member (other than the roster room coaches) in the gym during games, I had the principal's undivided attention when she stopped by to show support for our teams. Conversations at these events gained

me social capital with the administration, parents, and students. In addition, I gained symbolic capital as a teacher who cared about the school and my students by taking the time to support them outside of the classroom. Ultimately, my participation in this field allowed me to exert more control over my room assignments for the following year via the capital I held with the coaches in the roster room.

4.5.7 A Room of My Own

The summer after my first year at Urban Magnet, I received a call from the principal informing me that a new science teacher, Linda Loman, had been hired (also through the back door). Since I had volunteered to come in over the summer to clean and organize the science supply stock room, I decided to ask Linda if she would like to help. We spent the whole week before school re-arranging the stock room. My friendship with Linda provided even more possibilities for gaining the capital needed to access physical resources in the school because not only was she a science teacher, but she was also hired as the new basketball coach.

The week we spent organizing the science supply closet and painting over the graffiti in Mr. Lo's class really helped ease my transition into Urban Magnet because you introduced me to the staff. And because they knew I worked that whole week with you, it let everyone know I was a hard-worker like you. You transferred some of the social capital you had already gained with others and provided me with a means to build symbolic capital as a dedicated, hard-working teacher before the school year even started. (Linda, personal communication, May, 2004).

Our hard work did not go unnoticed by the principal or the roster room staff. As a reward, we were able to negotiate our way into semi-permanent room assignments over the next two years, limiting our floating to the third and fourth floors and into science rooms a majority of the time. As a result, my next two years of floating were much less chaotic. That Linda and I were able to negotiate more time in actual science classrooms was of obvious benefit to both our students and us. What was less obvious was how beneficial our close proximity to one another would prove to be during our involvement in the DUS study as we were able to support one another's teaching and research more easily due to our ability to move physically in and out of one another's rooms during classes. These structural changes, though welcomed by Linda and me, created some tension between us and the other science faculty because these changes resulted in the displacement of more senior teachers from

their classrooms, meaning all science faculty floated to some degree. However, those with the least seniority and less social and symbolic capital, like Mr. Lo, floated more than the others, again providing evidence of the importance of capital in affording teacher agency at Urban Magnet.

4.6 CONTRADICTIONARY CONTRADICTIONS

My experiences teaching science at Urban Magnet revealed many contradictions between the school's goal of providing teachers and students with a "supportive instructional environment" that "fosters a community commitment to strive for excellence in teaching and learning." However, the nature of the school structure set a context for several contradictory patterns of coherence in my own teaching practices. Where a floating schedule necessitated that I become very rigid in some respects (such as planning, organization, and monitoring student activities), it also required me to become more flexible in other ways (adapting lessons for many environments, learning to rely on few material resources, and creating small, mobile lab experiments). In these instances, the structure directly afforded my agency. A second unexpected benefit to the development of my teaching practices was the autonomy provided by my erratic schedule. While I lacked the administrative support I had grown accustomed to at Dewey, the complete autonomy I experienced in my classroom at Urban Magnet allowed me to develop and implement my lessons as I saw fit without needing to adhere to a scope and sequence curriculum that was not adaptive to the interests or needs of my students. As explored in the following chapters, this autonomy provided Sarah Kate, the student researchers, and me with the space to critically examine our roles as classroom participants in order to make substantial changes to the class structure that often resulted a more cohesive, equitable learning environment. However, these structural changes sometimes resulted in unexpected contradictions, and as such, presented us with new topics of discussion in our cogenerative dialogues as we attempted to collectively address and resolve these contradictions.

In addition, my struggles to succeed at Urban Magnet helped me to develop empathy for students in my own classes who also struggled with the school structures that oppressed them. Students often witnessed my struggles as a "new" teacher, including my inability to access resources and the isolation I experienced in relation to the

administration and my peers. These experiences galvanized a bond between my students and me as they rallied behind me in our common quest to “make do” and still succeed. These interactions forced me to consider their experiences in the school in a new light. Learning to access resources (both material and human) is also a concern for students, requiring them to seek the approval of their peers (sometimes at the cost of relationships with parents and teachers) in order to secure a supportive social network that may benefit them socially and/or academically. Recognizing student struggles sensitized me to the fact that peer interactions are significant in affording capital exchanges that can affect student participation and achievement in the classroom; this became a major focus of my research and is addressed in the next chapter.

CHAPTER 5

ELEPHANT IN THE CLASSROOM: A NEED FOR CHANGE?

Ms. Martin's Chemistry class reminds me of lunchtime. This class is when I learn the most about something that interests me. Like my friends at lunchtime, I learn more when they're relaxed, comfortable, and around people they know. Chemistry is like my friend and Ms. Martin is its voice. Chemistry tells me more about itself when Ms. Martin tells us the information in a creative way. Like today with Electron Configuration Battleship, the game was extremely educational and I had fun playing it. That class period was one of the most educational classes this year. If Ms. Martin continues to teach in this manner, I will feel prepared and confident in taking the SAT II for college (Chandra, electronic journal entry reflecting on cogenerative dialogue with Sarah-Kate and other student-researchers, February 11, 2002).

I would love to be able to say that my chemistry class has always offered an inviting atmosphere in which all students developed a real passion for the subject as well as a love for learning, but that would not be true. And it was not until my participation in this research that I could truly begin to understand why. Reading Chandra's journal entry today, her positive attitude about our chemistry classroom and my teaching practices are evident. Chandra states that in order for her to learn the chemistry that is to be assessed, she must be comfortable and have fun – a requirement that is not often fulfilled in a typical science classroom. Having taught Chandra in eighth grade, I knew that she did not enjoy science and she was not particularly fond of me as a teacher. During our first year, Chandra and I were often at odds in the classroom. Our interactions frequently resulted in me sending her to the principal's office for "unacceptable" classroom behavior. For these reasons, I was not optimistic that Chandra would be very successful in my tenth-grade chemistry class. Reading her student journal entry, it is still difficult to believe that she not only was successful in the course but that she specifically remarked that she enjoyed having me as her teacher. Previous chapters examined structures associated with urban schools in general and Urban Magnet specifically. This chapter continues by focusing on what my classroom was like the first year I taught at Urban Magnet (when Chandra was an

eighth grader) to expose the structures in place before my participation in this research.

5.1 REFLECTING ON THE PAST

As described in previous chapters, during my first year at Urban Magnet, both my students and I experienced many difficulties in our quest to learn and teach science. The structural constraints described in chapter 4 were influential in that they impacted the curriculum I enacted in the chemistry classroom as well as the social interactions between my peers, my students, and me. The practices that came to characterize and constitute our classroom were derived from the interaction between our past experiences with school and science, our dispositions to act based on these experiences, and the schema we constructed from our experiences. Illustrating the porous nature of fields, chapter 4 provided examples of some of the ways in which the larger structure of the school shaped the experiences of both students and teachers at Urban Magnet.

So what changed in my third year of teaching at Urban Magnet that contributed to Chandra's positive experience in science? Analysis of various data resources (e.g., field notes, cogenerative dialogues, videotape of classroom activity, and comments by participants) and reflection upon my teaching practices suggest there are numerous reasons for this change, including my increased understanding of the content knowledge due to my enrollment in the Masters in Chemistry Education program (MCE), greater confidence in my teaching abilities due to my four years' teaching experience, and better relations between the science faculty and me. But my analysis and reflection also suggest changes involving the ways in which I interacted with students in my classroom as well as the way I viewed science and science education.

To understand what types of changes occurred and why they were needed, I employ the frameworks of cultural sociology (Bourdieu, 1986, 1992; Sewell, 1992; 1999) and the sociology of emotions (Collins, 2004) to more specifically explore my evolving understanding of what it means to do science in connection with my teaching practices and my role in student/teacher interactions. I examine these issues by evaluating the structures of the classroom, including the schema, practices, and

dispositions initially enacted, and how those structures resonated²² with students to either afford or impede the enactment of science learning. This chapter makes clear the need for transforming the ways in which my students and I interacted with one another in science and introduces cogenerative dialogues as a tool for catalyzing changes. As will become evident in the next two chapters, the structural changes implemented in my classroom resonated with students because we co-constructed them through cogenerative dialogues. This chapter and the two that follow apply micro-level video and audio analysis to deconstruct and analyze the classroom as it was before, during and after my introduction to cogenerative dialogues. Specifically, chapter 5 provides a snapshot of my teaching prior to my involvement in various fields (including the MCE program and Discovering Urban Science) in an effort to explore my pre-existing schema and practices regarding science and science teaching before they were challenged by my participation in this research. While this chapter focuses on my growing awareness for a need to change my teaching practices, chapters 6 and 7 reveal how this research – specifically focusing on the emergence of cogenerative dialogues – afforded my students and me agency in the field of the classroom and in the larger field of the school and our lives outside of school.

5.1.1 Looking Ahead

In the following chapter I expand upon the nature of cogenerative dialogues (as introduced in chapter 2) by detailing how they came to be used, when and how they were employed, who was involved, and some of the topics discussed in these conversations. This arrangement enables me to examine how practices and schemas (Sewell, 1992; 1999) developed in the field of cogenerative dialogue informed the structures of the science classroom and ultimately allowed participants to develop structures that served to facilitate teaching and learning of chemistry. Specifically, chapter 6 explores how cogenerative dialogues occurring in multiple overlapping fields with numerous participants, served as a resource for my students and me as we began examining the way we enacted culture in our classroom and how this enactment afforded and/or truncated our agency. In addition, chapters 6 and 7 demonstrate how overlapping fields enabled my students and me to individually and collectively challenge the notion of what it means to *do science*, thereby enabling

²² Resonances between students' dispositions and the structures of a field can afford an individual access to and appropriation of resources within a field. If the structures of the field do not support their dispositions and practices, then resonances will not occur.

many students who were previously marginalized in class to become more fluent in their production and reproduction of our new conception of “science culture.” Remembering that identification of contradictions is essential to this research, each chapter addresses several important contradictions that emerged in relation to our changing beliefs about science and the interactions of students and teachers. These contradictions play an important role in defining the limits of the transformative potential of this research while providing direction for continued research both in and outside of the classroom.

5.2 CHEMISTRY CLASS BEFORE COGENERATIVE DIALOGUES

As described in chapter 4, the chemistry classroom can be thought of as a structured space that, due to its porous boundaries, is subject to external (surrounding school, neighborhood, societal) and internal (within the classroom) structural influences. As a field, the chemistry classroom provides a social setting in which culture is enacted. Cultural practices related to both social interactions and the doing of science are constructed through the schema that both my students and I hold regarding the nature of science and the science classroom and our ability to access resources to afford our practices. To understand the transformations that took place in our class, it is important to examine the classroom structures that existed before my participation in this research. This necessitates that I examine the ways in which my beliefs regarding the nature of science and science teaching shaped my teaching practices and student interactions within the chemistry classroom and vice versa.

5.2.1 Kickin’ it Old School

The following transcription is drawn upon to illustrate the structures of the classroom that afforded the type of student-teacher interactions that occurred between my students and me during my first year of teaching chemistry at Urban Magnet. In this vignette, we are reviewing for an exam. Students have been instructed to correct a review worksheet I created as we “go over the answers” in class.



Figure 5. 1 Sonya at the chalkboard.

During the entire class period, I remain physically separated from my students (see Figure 5.1) by positioning myself in front of the chalkboard with the teacher's desk acting as a divider between me the rest of the class. Students are seated alphabetically at lab tables in rows of two, facing forward. The following table²³ divides spoken word and accompanying gestures in relation to time.

Time(s)	Speaker	Discourse	Gestures
:00	Sonya	Lead oxalate. What is the formula for oxalic acid? Yes, Sir.	Leaning towards students on lab table holding answer sheet in both hands. Look at paper. Nod at student.
:06	Dan	$\text{H}_2\text{C}_2\text{O}_4$	Students all facing forward in rows.
:08	Sonya	Yes, he has $\text{H}_2\text{C}_2\text{O}_4^*$. Now how does he know there are going to be two* here? Uhm...(2.0) Tess?	*Turn to right answer on board then turn back to class. Tap on the board next to the "2". No student raises hand, call on Tess.
:19	Tess	Not sure.	
:20	Sonya	=Well you have, they gave you lead*, lead IV. What do you know about this?* what does this tell you about lead?	Turn back to board to write Pb^{4+} on the board. Point to the $^{4+}$.
:30	Tess	(no response).	
:31	Sonya	=Stock Number system?	Continue to point at the symbols – standing with back to class.
:32	Tess	Four? ↑	
:32	Sonya	=↓It's gonna be four.	Pointing and writing on the board. Look at paper.

²³ For more information about the transcript conventions used to analyze this interaction, please refer to the Appendix.

Throughout the 50-minute period, my students and I methodically tackle each problem, relaying the correct “answers” with efficiency and a singular purpose of “finishing the worksheet” to prepare for the exam. This transcript illustrated a pattern of limited verbal and physical interactions between my students and me that are representative of the type of interactions we engage in throughout the whole class period. During a time span of 33 seconds, student contributions totaled only four seconds, meaning that I spoke nearly 90% of the time. Furthermore, the pace is rapid since I allow students less than one second of wait-time between each question posed before I expect an answer.

Using the condensed transcript below, this whole-class interaction can be characterized in terms of a classic Initiation-Response-Evaluation (IRE) pattern (Mehan, 1979) of discourse in which the teacher asks a simple question that requires a short response from a student which is then quickly followed by an evaluative rejoinder before moving on to the next question or comment.

Time (s)	Speaker	Discourse
:00	Sonya	Teacher Question.
:06	Dan	Student Response.
:08	Sonya	Confirm answer. Teacher Question.
:19	Tess	Negative Response.
:20	Sonya	Leading Question.
:30	Tess	No response.
:31	Sonya	Leading Question.
:32	Tess	Pitch inflection – student guesses.
:32	Sonya	Pitch deflection – confirm response.

Further micro-level analysis of this vignette reveals that not only do I wait less than 1.0 second for a student response before I ask an additional question, but I actually begin to write the answer I am seeking on the board before giving Tess an opportunity to respond. This type of interaction occurred throughout the entire class period and is representative of my general pedagogical style for teaching chemistry during my first year. Micro-analysis of my gestures in correspondence to my speech (as illustrated by the description in the gestures column from the full transcript on the previous page) reveals that within this 33-second interaction, my back was turned away from the students towards the board for a total of 15 seconds – meaning nearly

50% of this interaction involved students looking at my back while I consulted my notes and wrote on the board. Immediately following this vignette, I continue to “explain” the answer to the class with my back to the students for another 15 seconds as I point to the board and consult the notes I am holding in my hand (see Figure 5.1).

5.2.2 (*Out-of*)-Field Notes

Reflection upon this vignette raises questions about my actions, such as why I allow so little time between my asking questions and my answering or reiterating answers that students have provided. Conscious of the lack of student enthusiasm for this activity and wary that we will not “finish before the bell rings,” I maintain a quick tempo throughout the period – a machine-gun cadence of question/response. I sustain this frantic pace in anticipation of filling the silence should no student respond to my queries and because it was very important for me to “stay on track” and to be in control by restricting the questions asked. A strategy I employed the first week of class (and continued well into my third year), I learned to hand-write a class “script” for each lesson (in every subject I taught) which included the questions I would ask, the notes I would write on the board, and even jokes I would include “if the climate permits.” Script in hand (see Figure 5.1), I attempt to ensure that there was never any “down time” in class that might encourage students to ask chemistry-related questions or become socially interactive with one another and start to misbehave. Contributing to my fear was the fact that I was teaching out of field. Struggling to maintain the facade that the teacher is the “holder of knowledge,” I was frightened by the prospect that, given the opportunity, a student might ask a question I would not be able to answer, thereby contributing to the possibility that I would lose control and power in the classroom. As an inexperienced teacher in a selective high school, this was a great concern for me. In the following transcript, a student comments on his inability to ask questions during that first year in comparison to his experiences with me as his Biology teacher in his senior year.

Definitely in 10th grade there was a stigma that if we were moving along and you didn’t have a *real* pressing question you shouldn’t ask it.... Like you should listen and maybe find out later in the class period. Like now we converse more with the material... we ask more questions. Like I remember there being...her standing up in front of the class and um, just writing stuff down... us just taking notes. Now it is definitely more comfortable if you

want to ask her a question, if you are interested in something, even if it is not directly related to lesson plan. Like now, she'll take just like a typical science question that a kid might ask a science teacher. She'll take time to address it and explore it a little bit. (Larry, Interview, March 2002).

As illustrated by Larry's quote, my need to fill the entire period with a scripted discourse allowed me to "lead" my students through the lesson. Thus, my whole-class interactive lectures did not permit deviations from the script, limiting students from asking questions that might "throw me." My practice of preparing this script left no real role for students in my class other than "receiver of knowledge." In my mind, students were completely divorced from the lesson plans I created. Not only did I make it impossible for them to ask questions, but I also controlled where they sat, who they worked with, how long they had to consider a problem, and even what questions were important for them to consider. These were all tasks reserved for the teacher. Interestingly, while I limited students from interacting with their peers and me during class (a resource I now rely heavily upon) I always provided students with lots of resources for their learning. I created and distributed volumes of worksheets, notes, diagrams, and extension activities to support their learning, but the way I structured the class activities (while affording agency for some visual learners) truncated the agency of students who needed to discuss concepts and actively interact more with the material to learn. By controlling the way in which we used these resources (going so far as to direct students, step by step, to the pages they should reference and how long they should spend on each question) I afforded my agency in class by supporting structures that enabled me to feel comfortable in the classroom. Unfortunately (and unknowingly), I sacrificed the comfort of my students in the process.

5.2.3 Co-teaching Chemistry?

During my first year of teaching, this pattern of not allowing students to engage in conversations with me at the board is met with contradiction only when I interact with two male students, Dan and Jon, both of whom I openly acknowledge are "better than me at math." While I rarely interacted with students outside of the controlled I-R-E pattern described above, transcript analysis of the 50-minute period reveals a tendency for my interactions with these two students to be more equal with regards to speaking time. I tend to converse with these students more throughout the class period – using them as a classroom barometer for "understanding." I call on

them to “show other students how you got that at the board” and to “explain to the class” what we just discussed. Seated in the first row directly to my left, Dan and I often engage in semi-private discussions about my calculations when there is a discrepancy between my answers and his. In answering my questions, both Dan and Jon were able to serve as resources for their peers while simultaneously gaining and reinforcing dispositions that led to their own increased science fluency. However, my practice of privileging their voices because it was a non-threatening way for me to interact with “the class” unfairly disadvantaged all the students who never had the opportunity to speak.

Ironically, Dan and Jon were two of my worst critics at the beginning of the year as they often made disparaging remarks about my math skills. This changed when one afternoon they happened by my office while I was playing a CD from an obscure independent-pop band. Being self-described “music geeks,” Dan and Jon were very impressed that I knew this band and had seen them in concert. Seeing that I was struggling with the homework assignment for the next day, they offered to stay with me while I worked the problems. Afterwards, they frequently came to my office in the afternoons. The conversations we had about chemistry after school served as a resource for me in the classroom and explains why I looked to them for help more than consciously avoiding others. I gained social and symbolic capital outside of the classroom and used it within. When Dan and Jon accepted me as their chemistry teacher, so did the others because they were supposed to be the “smartest” in the class. I often discussed the class and my teaching with these boys outside of the classroom and sometimes instituted changes based on their observations and suggestions. It is significant that during my first year at Urban Magnet, I was willing to entertain the possibility of change – but only “behind the scenes” and away from the classroom.

5.2.4 A Need for Change?

My initial intention for introducing this vignette from my first-year chemistry class was to provide a snapshot of my teaching practices prior to my involvement in the DUS research project. However, repeated viewing and analysis of this 30-second video clip revealed more than I had expected. Re-viewing the tape now in my

seventh year²⁴ of teaching, I feel strangely disconnected from the person I see at the front of the room. While there is no doubt it is me in the video, I can barely recognize myself or what I have come to characterize as my science classroom. Three things stand out that are significant: the classroom is eerily quiet, students are not encouraged to talk to their neighbors and are often told to “be quiet,” and my voice is cold and flat. While no students exhibit behaviors that would be considered negative, it is very clear from the video that the low emotional energy in the classroom did little to foster solidarity among my students and me. This tape was recorded in May of my first year at Urban Magnet after spending nearly nine months with these 31 students and yet it could have been mistaken for the first day of the year based on the lack of emotional energy and connection exhibited between my students and me. It is only after the bell rings to signify that “class” is over that my students and I can be seen interacting with one another in the relaxed and playful manner that reminds me of my classroom today. No longer required to behave as “the teacher,” I joke with and laugh with students while gathering my belongings to float to the next classroom. In addition, just before turning off the camera, I am seen kneeling next to the desk of a student as we talked about a question he had.

Perhaps most striking about this video recording is that my students and I chose this tape as a representation of our “best teaching and learning” to be submitted as part of my application to the MCE program which I began that summer. My students and I recorded several class periods before selecting this lesson for submission. To us, this classroom epitomized what a “good” chemistry classroom should look like. Our interactions are pleasant, we are focused on our task of teaching and learning chemistry, and there is no doubt that many of these students are in fact, learning chemistry and enjoying this classroom. An example of this comes from an interview in which Sarah-Kate asks one of the students in the video what he thought my goal was for him as a chemistry learner. He states

To learn, like she was. To get the basic idea. She didn’t know everything about chemistry, but she was trying to fill us with as much information as she could. I think she worked pretty hard, reading every night. She just wanted us to learn everything we could about it. ...I remember coming out at the end of

²⁴ During this research, I was in my fifth year of middle school and high-school teaching. For the past two years, I have taught at the graduate level working with pre-service science teachers as a co-instructor in their science methods course and in their classrooms as their student teaching supervisor.

the year, it was probably my favorite class all year and the one that I learned the most in. I would definitely take it again. (Bill, Interview, January 2002).

Just like Bill, many of the students in my class performed well on exams, turned in meticulous lab reports, and developed a fairly complex understanding of the chemistry concepts we covered. In addition, many of these students would report that they “liked” the class and my teaching. A majority of students in this classroom were able to access and appropriate the resources they needed to be successful within this structure, but in this class and in all the other science classes I taught that year and each year afterwards, at least 15 to 25 percent of my students failed or made less than a C. It troubled me that while all these students were considered high achieving, I consistently produced a large number of students who would be characterized as having “failed science.”

It was not until my involvement in this research and my introduction to cogenerative dialogues that I began to understand how my beliefs about science and science education played a role in “failing” these students. This is a critical point because it illustrates how difficult it was for me to recognize and accept my role in limiting student participation and success in my classroom. That it was difficult to admit made it practically impossible for me to make any changes. This is especially true given that numerous factors including the expectations of school administrators, parents and students – not to mention my own expectations – all supported and reinforced the way I taught without ever really encouraging me to change. In the following sections, I describe my awakening as a science educator as I began the process of examining the schemas I developed as a *science learner* and how my schema afforded my practices as a *science teacher*.

5.3 THE CULTURE OF SCIENCE

5.3.1 Educational Darwinism

The science classroom can be thought of as a field in which the “culture of science” is enacted as teachers and students *do* science. When students learn science, they generally *produce* or *reproduce* this culture as they interact with the structures of the classroom. The way in which students experience this structure, and thus science, is largely dependent upon culturally and historically constituted practices that have been developed over time based on their lived experiences. For many students,

including myself, science is experienced as a rite of passage, something to be “survived” or “endured.” As a pre-med student, Organic Chemistry was presented as a litmus test for determining who would gain admittance to medical school based on scores from a sophomore year science course. My professors constantly touted this course as the class that separated the “wheat from the chaff,” forcing me to view my experience in this science class as a sort of educational Darwinism where my performance was judged as a “survival of the fittest” with only those who earned an A could continue on in their quest to become a doctor. Having successfully survived this trial, I developed a personal sense or belief of what it meant for me to learn science and to be successful at it. Consequently, my relationship with science was cultivated within a culture of *doing* science that is representative of an ideology preserving the notion that science is an exclusive club to which many are not extended membership. For this reason, while it bothered me that some of my students failed every semester, these failures did not surprise me because I believed that not everyone would be successful in science. Not only did I accept that not all students would pass, I actually believed it was acceptable for a few students to fail each term because “science is hard.”

5.3.2 *Hegemony and the (RE) Production of Science Culture*

A product of an educational system built on the same achievement ideology prevalent at Urban Magnet, I too initially believed that my students were to blame for their failures. A testament to the power of hegemony, I believed I had succeeded in school because I had “worked hard.” Discussed in chapter 3, student failure at Dewey Middle had been easier for me to accept than at Urban Magnet where students were hand-selected to succeed. Believing that Urban Magnet students were exceptional, but lacking confidence in my own ability to competently teach chemistry, I had reason to believe that my students were not solely to blame for their failure. On the contrary, I did not attribute student failure in my biology and eighth-grade science classes to my teaching practices because these were my areas of expertise. My perception was that students who were failing chemistry did so because I did not know what I was doing and that students who were failing in my other courses did so due to some fault of their own. As chronicled in chapter 3, I felt obligated to improve my chemistry content knowledge to better serve the needs of my chemistry students, so I joined the MCE program. It is significant, however, that

at the time I did not imagine I was joining the program to improve my practice of teaching chemistry. I simply believed that if I knew more chemistry, I would become a better chemistry teacher. This is salient in that it speaks to my beliefs concerning the nature of science and science teaching. Now, as part of my evolution through this research I realize that the majority of my students in all four classes were failing for the same reasons: because I did not attempt to teach in a manner that included them, because they were not comfortable working in the groups to which I assigned them, because they had limited access to necessary resources, and for numerous other individual reasons that were unimaginable for me before I started participating in this research.

5.3.3 Teacher Beliefs and Classroom Structures

Numerous studies suggest that teacher beliefs about the nature of science have a considerable impact on their classroom practices (Brickhouse, 1990; Good, 1981; Tauber, 1998; Tobin & Gallagher, 1987). Similarly other research (Lederman, 1992; Tobin, Kahle, & Fraser, 1990) indicates that teachers exhibit instructional styles that are consistent with their beliefs regarding science and science learning. Thus, my unconscious beliefs, constructed from my previous experiences as a learner, shaped my teaching practices in my classroom. The constructivist theories about teaching and learning that I had embraced in graduate school (where I was trained to teach elementary school science) were abandoned when I started teaching at the high school level. Thus, I consciously and unconsciously chose to maintain and perpetuate the image of science as I had experienced it in my own high school and college courses by emulating the teaching styles of my previous science teachers. As such, I unknowingly supported and perpetuated an ideology of meritocracy within my own classroom that ultimately marginalized certain students who experienced this image of science as hegemony rather than ideology.

5.3.4 Science Learner, Science Teacher

It is hard for me now to understand how I could have supported such an oppressive ideology and associated practices, especially considering the difficulties I had faced as a learner in these “traditional classrooms.” Research concerning teacher beliefs and teaching practices offers a plausible explanation involving cognitive belief systems. Tobin’s (1990) chapter “Teacher Mind Frames and Science Learning” in

Windows into the Science Classroom: Problems Associated with Higher-level Cognitive Learning offers the following:

One explanation of why individuals are so steadfast in maintaining present orientations, conceptions, and perceptions in the face of contrary evidence is provided by considering cognitive beliefs. Goodenough (1971) noted that belief systems take on appealing, compelling, and emotionally-laden dimensions, and that individuals are reluctant to give them up because of the cognitive disorder that would seem to follow from the disbelief (pp 35).

My reflection through this research, my participation in cogenerative dialogues with my co-researchers, and the process of writing my educational autobiography have enabled me to piece together my choices regarding my teaching practices in the years before engaging in this research. That my newly evolving schema involving constructivist teaching practices was abandoned for self-preservation as a new teacher being asked to teach out of field is also not hard to understand. As Tobin (2000) describes of his own experiences teaching for the first time in an unfamiliar environment, my newly developed teaching practices and beliefs were in complete “break down,” forcing me to “react to” rather than “anticipate” student practices and interactions. Teaching on autopilot without any opportunity to reflect on my practices, I managed as best I could without really questioning my role in contributing to student failure. That is until I experienced “failure in science” for the first time.

5.3.5 Identifying with Failing Students

During my second year as a chemistry teacher at Urban Magnet, I encountered my first stumbling block in the MCE program as I began to struggle in Molecular Spectroscopy. In an attempt to “work harder,” I spent large amounts of time preparing for this class. I memorized “facts and formulas” but was unable to apply my knowledge because I lacked a conceptual understanding of the physics required to use these formulas. Embarrassed by my low marks on the first exam, I avoided contact with my professor and my peers, further limiting my access to much needed resources. Isolated from these human resources, I was able to pass the course only after asking Mr. Lo to tutor me after school and by completing alternative projects and extra-credit assignments. My inability to approach my professor and peers for help while struggling in this class became an invaluable resource for me later in cogenerative dialogues with other teachers and students.

This event was salient in my development as a reflective teacher because I began to draw parallels between my needs and struggles as a learner in this class with the needs and struggles of the students in my science classes. Serving as an important resource for me as I began my journey of reflecting with others, for the first time I began to wonder why when students were failing my class, they did not ask me for help. My experience as a student in the MCE challenged my beliefs about why I thought students did not ask me for help when they needed it. Confronting my inability to approach my professor when I struggled, I felt I better understood why my students might not have felt comfortable asking me for help. Just as my MCE class lacked the structures needed to support this type of student-teacher interaction, so did my own classroom. However, recognizing a need for change and making change are two different things all together.

5.4 COGENERATIVE DIALOGUES – A CATALYST FOR CHANGE

My practices and the practices of my students were so deeply rooted in our past social, historical, and cultural experiences with one another and the school, that the mere recognition of the need for change was not enough to help me implement the structural changes required to allow me to interact with my students and science in the ways I wanted. In the previous two sections, I presented some of my experiences as a teacher and learner that served to make me consciously aware of my role in shaping student opportunities for learning. My experiences in the MCE encouraged me to explore my relationship with science, but I was still unconscious about my desire to preserve the belief (for me and others) that “science is hard” and that “science is not for all.” My beliefs about what constituted chemistry were deeply entrenched. There remained a disconnect between this acceptance that my teaching practices disadvantaged some students and my ability to consider my role as an agent of change in my own classroom. For this reason, even while I was growing to understand the importance of the role of the teacher in making “science for all” a reality, these realizations did little to alter the structure of my classroom or my teaching practices because the influence of these lived experiences were limited due to my superficial understanding of their meaning. The following is an excerpt from an audiotaped cogenerative dialogue between Sarah-Kate and me that clearly demonstrates my continuing struggle to reconcile my changing understanding of what I wanted my chemistry class to become and what I fought to maintain. In this

conversation, Sarah-Kate asked me to deconstruct how I was feeling during chemistry class after reading a transcript of the class period in which several of my students suggested they be allowed to bring a formula card to their mid-term.

- Sarah-Kate: All right. You saw the transcript. Can you talk some about the note card incident? How you felt.
- Sonya: The note card incident. When I read the transcriptions, I immediately, I felt this weird quilt feeling in my stomach and, and I told you about it when it was going on [during class]. That somehow it [allowing the note card] means the class isn't hard ↑ enough. That in order for it to be chemistry. It has to be hard and it has to be almost unattainable for some— well unattainable for some, you know, and attainable to just a few who get everything – and that is what makes it chemistry. And that is how I was taught it. That's how I learned it. And every class I have had until recently was either sink or swim, you made it or you didn't, you know, this is all on you. And it is supposed to be hard and teachers did not really help us. And somehow, it's like a hazing almost. Like look I made it through. And I have to struggle with that. With that feeling that I made it through and *I* did not *need* any cards.... I really have to check myself for that a lot. Like, something in me wants to “make it harder” because that is what *real* chemistry would be.

This conversation took place in January 2001, five months after I became involved in this research. This is significant because while I readily agreed that there were some real problems in my classroom – structures that were preventing some of my students from performing well and feeling good about science – I was still slow to make what seemed at the time like a drastic change in my teaching practices. The structures of the school as well as my and my students' expectations for the way science class was *supposed* to look all served to support and reinforce my current teaching practices. This is why cogenerative dialogue was so powerful in affording me the opportunity to begin this process of self-reflection with others while specific issues were discussed and alternative actions were considered.

5.4.1 A Tool for Change

As an urban educator, I was accustomed to the rhetoric from the district office instructing me to “change my teaching practices,” but for the first time, I felt as though I had actually been armed with a real tool for making these changes. So while my participation in the MCE program encouraged me to empathize with my students as learners, these new realizations did not support my change in the classroom on any significant level. It was not until my introduction to cogenerative dialogues that I was provided with a tool that would allow me to make sustainable changes (from the bottom up), something that was always lacking in the top-down reforms touted by

the constantly changing school district administration. In subsequent chapters, I explore how my experiences of cogenerative dialogue and those of my students provided a structure to develop new practices and dispositions that enabled us to talk about issues in the classroom in ways that were both constructive and non-confrontational. In addition, I address how these structural changes afforded individual and collective agency for my students and me that enabled us to transform the way we interacted both with one another and with science.

5.5 CODA

5.5.1 *Risky Behavior*

A pattern of coherence that is a contradiction to my reluctance to engage students in conversations about changing oppressive school structures was my role as social activist in the school in which I encouraged and assisted students in various struggles against the administration and other teachers in which I felt students had been wronged. Outside of class, I engaged in cogenerative dialogues with students concerning issues in the school – such as the need for an Asian youth group and ways to increase visibility of racism and homophobia among students and staff. Outspoken in my participation as co-advisor to gay, lesbian, and bisexual youth in Allies (a national support group for questioning and gay high school students), I often voiced my concerns for these students to faculty and administration when few others did. Seen by students as a champion of student rights, a large group of Asian students approached me to help them organize an Asian student association. The administration initially denied our request on grounds that it was racially divisive. Incensed by the fact that the school supported an African American student group and several different religious organizations, my students and I persisted until granted permission. Many teachers commented that my efforts were “political suicide,” warning I may find my room assignments and schedule changed in the following school year. However, I was willing to risk administrative retaliation because I believed these students had a right to build a community within the school that supported their individual interests and needs – just like the gay and questioning youth in the school.

Comfortable in my role as social activist, I constantly asked students to question “The Man” – but not when “The Man” was me! Again, the identity I assumed as

teacher did not conform to my image of me as a person. Although I often felt I was presenting myself as two different people, until I was provided with a structure to integrate these two images of me, they remained separate. In my mind, a teacher in the classroom was supposed to be a certain way: have power, maintain a sense of formality with students, and have the final say on all decisions no matter how unreasonable. My identity as a teacher contradicted my personality and my view of the need to get to know students on a personal level. It was not until my participation in this research and especially in cogenerative dialogues with others that I began to understand that my schema not only about teaching, but also about teachers, was in contradiction to what I believed constituted effective teaching practices.

CHAPTER 6

FROM THEORY TO PRACTICE: COGENERATIVE DIALOGUE PAVING THE ROAD FOR IMPLEMENTING CHANGE.

In the previous chapter, I focused on my schema and practices regarding science and science teaching prior to my participation in cogenerative dialogues to highlight how my schema and practices have evolved over the course of this research and how these changes have afforded my students and me to become agents of change in our chemistry classroom. This chapter builds on chapter 5 by exploring how participation in cogenerative dialogues with multiple research participants allowed my students and me to critically examine our beliefs about science, science education, and the way we viewed our relationships with one another both in and out of the chemistry classroom. These conversations provided a pathway for change as our participation in these cogenerative dialogues served as a resource for us as we began examining the ways we enacted culture in our classroom and how this enactment afforded and/or truncated our agency.

6.1 STRUCTURED FOR CHANGE?

6.1.1 Emerging Interest in Cogenerative Dialogues

As detailed in chapter 2, the emergent nature of this research meant there was no predetermined focus to our research outside of identifying and reinforcing patterns of practices that supported learning while simultaneously identifying the associated contradictions to these patterns in an effort to address, remove and when beneficial, strengthen these contradictions. We did not set out to find specific patterns, but rather each of us (me, my students, and Sarah-Kate) investigated and focused on issues that interested us throughout the year. This included (but was not limited to) my use of inquiry and groups, student interactions in these groups, and my interactions with students both inside and outside of class. Because we did not set out to see how cogenerative dialogues would affect our classroom, none of us realized how significant the role of cogenerative dialogues would be in transforming our classroom until they emerged as a central activity by the end of the school year (and continued to be significant even after the school year ended). For this reason, many

of these early cogenerative dialogues were not recorded using video or audio. Fortunately, I am able to draw from a rich variety of other data resources (including field notes, journal entries, interviews, and electronic correspondence) to represent and re-create the events that transpired during these early cogenerative dialogues in their various forms. In the following sections, I expand upon the description of cogenerative dialogues as first introduced in chapter 2 to clearly delineate how cogenerative dialogues were used to transform our classroom.

6.1.2 Cogenerating Change

Described by Roth and Tobin (2002), cogenerative dialogue enables participants to “use current understandings to describe what has happened, identify problems, articulate problems in terms of contradictions, and frame options that provide us with new and increased choices for enacting teaching and learning” (p. 252). As such, cogenerative dialogue can be viewed as a field (Bourdieu, 1986). LaVan (2004) states that within this field, “culture²⁵ gets produced, reproduced, and transformed as participants interact within the social space” where these cultural practices are then “available as resources to be accessed and appropriated by participants to produce new culture” (p. 67). Conceptualized as a field, which is loosely bounded and porous, it is easy to see how the culture that is produced (consciously and unconsciously) in cogenerative dialogues in one field can serve as a resource for the interactions and dispositional practices that get enacted in other cogenerative dialogues and in other fields, such as the chemistry classroom. For example, the practices and dispositions I gained as a participant in cogenerative dialogues with Discovering Urban Science (DUS) teacher-researchers were drawn upon as a resource in my conversations with students or Sarah-Kate in the classroom. As my students and I took part in different cogenerative dialogues, we developed different ways of interacting. Due to the porous boundaries of cogenerative dialogues, these new cultural practices spilled over into the classroom, thereby providing us with a means to reflect on our practices in the moment to make changes to our practices.

²⁵ Culture here is being defined as a weakly bound system of schema and practices that interact in a dialectical relation with each other, material resources, and agency (the power to act and appropriate resources to meet one’s goals) (pg. 67, LaVan, 2004).

6.1.3 Overlapping Fields – Multiple Opportunities for Reinforcing Theory

As stated in the previous section, cogenerative dialogues were not a planned focus of this study; rather, their role in providing my students and me with substantial opportunities for change emerged as one of the more important findings from my research. Analysis of a variety of data resources (including video and audio transcripts, field notes, and journal entries) make it clear that while participation in individual cogenerative dialogues were essential in initiating the process of reflection that afforded changes in my teaching practices, it was of equal importance that these fields overlapped with one another (see Figure 6.1).

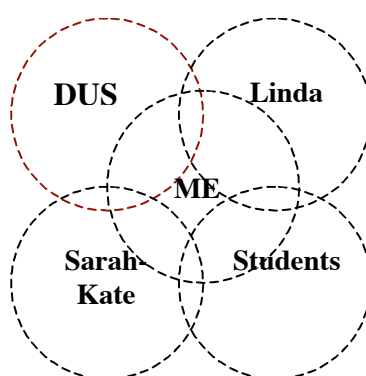


Figure 6. 1 Overlapping fields of cogenerative dialogue.

With the exception of Linda, all the other teacher-researchers in the DUS study (including Sarah-Kate) were also Masters of Chemistry Education participants. The porous nature of fields provided the intersection between two important fields (DUS and MCE) in which both my fellow teacher-researchers and I were constantly asked to consciously consider the ways in which our experiences as students in the MCE program were shaping our individual teaching practices in our chemistry classrooms.

My interactions with Sarah-Kate as a student in the MCE program, a member of the DUS study, and a full participant in my classroom provided me with opportunities to reflect on my practices with another over multiple overlapping fields. Finally, because Linda was both a DUS member, a teacher in my science department and a coach in the school, her presence overlapped with both my students and me in a variety of fields. Participation in these different fields of cogenerative dialogue provided each of us with multiple opportunities to exchange cultural, social, and symbolic capital, which enriched our ability to interact with one another on different

social levels – providing us with deeper understanding of these mutually shared experiences.

As we participated in these various cogenerative dialogues with multiple perspectives, we were all able to bring about change by restructuring the class to implement the changes discussed in these different fields. In this chapter, I explore the ways in which these discussions served as pathways for developing improved student-teacher relationships by demonstrating how these interactions served as resources for my students and me as we engaged in discussions that lay outside the realm of traditional teacher-student relations. Traditional classroom structures do not provide students and teachers with opportunities (or inclination) to discuss the roles and goals of students and teachers in the class – much less their interpersonal relationships. This is especially true in crowded urban schools where teachers may encounter nearly 200 students per day. The sheer number of students alone provides an extra hurdle that would make these types of conversations improbable. This means that teachers are generally uninformed about a wide range of topics that can affect student participation and achievement in their classroom. As an urban educator, I faced many of these same constraints. It was not until I was introduced to cogenerative dialogues that I could imagine a scenario in which I would be able to talk to my students about these issues.

As I learned more about my students' lives through our discussions, I began to understand the ways in which seemingly inconsequential actions on my part could have a substantial effect on their lives. Altering due dates for projects or postponing exams, I learned, could seriously jeopardize a student's ability to perform well in my course if that student's living arrangements (living in a shelter, traveling between two parents, or even observance of religious holidays) necessitated a schedule that remained fixed and consistent. This research prompted conversations with students that revealed that many led a very transient existence that often prevented them access to necessary resources (such as computers, libraries, or parental support) on certain days of the week. Inconsistency on my part sometimes placed these students at a disadvantage in that they were unable to complete assignments that required resources they were unable to access. This example makes salient the fact that a teacher's classroom practices need not be exceptionally cruel, overtly racist, or

inherently uncaring to have a negative impact on student participation, achievement, or self-esteem. It is a testament to the ability of these students to achieve at such high levels even while dealing with such difficult circumstances. But without cogenerative dialogues, most of these realities would have remained hidden from my colleagues and me.

6.1.4 Leveling the Field (of Cogenerative Dialogues)

So how did these conversations occur? What made it possible for me to have these conversations with my students and them with me? Characterized as essential to successful cogenerative dialogues, “buy-in” (LaVan & Beers, in press; LaVan, 2004) is established by fostering a shared understanding of the roles of participants and the rules and goals of these discussions which all serve to provide a “shared language base” that allows participants to “become empowered as they would now have a Discourse (or shared ‘toolkit’) to draw on in examining and understanding their practices and schemas” (p. 67, LaVan, 2004). In subsequent sections, I argue that these overlapping fields promoted a sense of solidarity – which grew out of this tight social network of research participants – to produce positive emotional energy and increased coherence in our practices (reflecting, evaluating, inviting discourse with others about our practices) within different fields of cogenerative dialogue. As discussed in chapter 2, cogenerative dialogues (both formal and informal) provided a safe space that allowed my students and me to build and continually reinforce our personal relationships with all the participants in this study. LaVan (2004) further asserts that a final component necessary to “foster buy-in” is to focus on what Roth and Tobin (2002) call “collective action.” These shared experiences fostered a community of trust and solidarity (Collins, 2004) with others that enabled us not just to reflect on our beliefs and practices, but also to change them. While I was engaging in cogenerative dialogues with Linda and other teacher-researchers, Sarah-Kate was engaging in dialogues with my students, enabling them to develop similar dispositions and to produce positive emotional energy and increased coherence among their peers. These conversations equipped us with a common language and a base of reference from which to evaluate the structures in our classrooms.

Sharing this common lens was important as we started analyzing and then altering classroom structures to promote resonance with our newly acquired cultural practices

(e.g., talking to one another or asking questions). Over time, we were able to fluently reproduce this culture in the classroom during both our whole-class cogenerative dialogues and our smaller student-teacher huddles. Noted from microanalysis of video and audio transcripts, as my students and I continually engaged in these multiple overlapping fields of cogenerative dialogue, we individually and collectively experienced positive emotional energy that fostered solidarity among us (demonstrated by synchronous body movements and discourse patterns in which we finished one another's sentences, etc.) that ultimately enabled us to take risks together as we continued to examine and re-structure the classroom to increase student agency and fluency in science. This chapter explores how participation in cogenerative dialogues in varying overlapping fields (see Figure 6.1) provided my students and me with opportunities to reflect upon our practices and our beliefs over time with the conscious intention of resolving contradictions with others and providing options for action.

6.1.5 Organization of this Chapter

Since cultural sociology encourages us to regard each arrangement of cogenerative dialogue (constituted by a variety of participants in different spatial and temporal spaces) as different fields, it is necessary to consider the different structures associated with each of these fields and, consequently, the different opportunities for agency offered to each participant. Remembering that agency is a social construction, it is also important to consider the changing role of capital exchanges among varying participants in these conversations over time. To demonstrate the ways in which participation in these cogenerative dialogues afforded my students and me agency in the classroom, it is necessary to provide a detailed description of the structures associated with each of the four arrangements of cogenerative dialogues (with DUS members, huddles with Linda, huddles with Sarah-Kate, and huddles with students in class). To facilitate this, I consider these arrangements in four separate sections divided into two chapters (6 and 7), each focusing on a different field of cogenerative dialogue and the myriad ways in which the porous boundaries of these fields enabled the overlap that magnified the transformative potential of each individual field. As a central participant in each of the four fields, I focus on my own experiences as a link between the four fields while simultaneously interweaving the perspectives of other participants.

Being more experienced as I entered my third year at Urban Magnet and my final year in the MCE program, I was better equipped to analyze my own practices while considering the suggestions of others, which I think made me more open to change during this process. In recounting how changes occurred, I focus on the chronological development of my involvement in cogenerative dialogues – starting first with my involvement in the weekly DUS meetings with other teacher-researchers, followed by my continued conversations with Linda at school and at home, then with Sarah-Kate and my students. Although my initial involvement in these four different fields of cogenerative dialogue occurred in chronological order, as my participation in the research evolved, I began participating in numerous cogenerative dialogues with a variety of participants—thus making it necessary for me to interject overlapping developments from different arrangements of cogenerative dialogue in each of the following sections.

6.2 EXPANDING THE CIRCLE OF INFLUENCE: DUS PRESENTATIONS

Using video from our classrooms, each week different teachers bravely encouraged collaborative reflection on their changing practices with the entire DUS research group by presenting their findings during seminar. In this way, we began to “expose ourselves” to one another, sharing our best and worst teaching moments, but with the realization that we shared a common purpose – to improve our classrooms. Listening to other teachers, I learned the ways in which this research was shaping different kinds of urban classrooms – all serving students with needs that were both similar to and different from the needs of my students at Urban Magnet. I found that many of the problems I faced as an urban educator were not unique to my school, my classroom, or my students. Participation in these meetings provided me with multiple opportunities to positively engage in these social interactions, serving to strengthen my feelings of solidarity with the group that contributed to my continued “buy-in” concerning the collective goals of our research and the potential benefit of cogenerative dialogues in my classroom. In addition, these meetings provided us with new theories and lenses to use while reflecting upon our practices – both in this field of cogenerative dialogue and in others.

My participation in these conversations within the relative safety of our weekly DUS seminar meetings (outside of the realm of school and the classroom) empowered me

with the tools I needed to begin to examine and understand my schema and praxis “in the moment” in the classroom. This coupled with the fact that other teachers were admitting they needed to make changes to help their students learn helped me feel able to admit my need to change as well. Collins (2004) asserts that once a community of people share a feeling of solidarity, the positive emotional energy shared by the collective can be transferred to the individual and can be used to make change. The positive emotional energy I derived from my participation in these conversations filled me with “a feeling of confidence and enthusiasm for [these] social interactions” (p. 108) that gave me the “courage to take action” (p. 39). Using the dispositions I gained in these overlapping fields, I continued to question my schema outside of our weekly meetings in order to change my teaching practices inside the classroom.

These shared experiences, over time, allowed me to begin the process of critically reflecting on my own teaching practices without fear of being publicly lampooned (by students, parents, my peers, and administrators) for making mistakes. Engaging in this research was a risky decision for me to make, but it was empowering because it meant that as a teacher I could begin to identify (and eventually own) my mistakes. I started developing the courage to admit my shortcomings because I felt empowered by the belief that, with the help of others, I could implement real change. Just as I expected my students to learn from their mistakes, I started to change the expectations I held for myself as a teacher. No longer engaging in “teacher talk,” the conversations I now had with other teachers about my classroom seemed more legitimate. Reflecting upon my practices with other DUS members, I started to feel empowered by my role as a teacher-researcher. No longer afraid that someone would find out I was not perfect, I began to share with parents, students, and other teachers by saying things like “the research we’ve been doing in my classroom shows” or “in researching my teaching practices, I’ve noticed,” because I now felt a sense of responsibility to acknowledge my faults knowing that I could work collectively with others to resolve contradictions

Initially this “collective” work took the form of cogenerative dialogues, first with Linda, then with Sarah-Kate, and finally with my students. This was an important transition because Sarah-Kate and my students, unlike Linda, were actual

participants in my classroom and as such, contributed to the structure. As detailed in chapter 2, both Linda and Sarah-Kate engaged in a variety of conversations with my student researchers and me outside of the classroom, effectively laying the groundwork for us to be able to question, reflect upon, and change our teaching and learning practices during class. At the beginning of this research, I must admit that Linda and the other DUS teacher-researchers held more cultural, social and symbolic capital with me as teachers than did Sarah-Kate and my students. I felt that other practicing teachers understood better the difficulties I faced than did my students and Sarah-Kate. Over time, I learned to see both Sarah-Kate and my students as experts on teaching and learning as much as any of the teacher-researchers because each had his or her own unique perspectives and experiences in my classroom. In fact, I came to view them as more the expert in our classroom, (where they were all participants) than anyone else. However, these changes were slow to occur, as is addressed in the following sections.

6.3 SUBWAY SOLUTIONS

6.3.1 Co-generating Change on the Way to Work

Reflecting on my early teaching practices, it is easier now to see that much of my inflexibility and need for control stemmed from a fear that others would find out how little I really knew about teaching (much less teaching science). As a young teacher in the highly competitive environment of Urban Magnet, facing parents and administrators who expected me to “know best” how to teach their students – I was afraid to admit to anyone (even myself) when I made mistakes. This fear prevented me from honestly evaluating my practices and from sharing with others when I felt I had fallen short. Previously described in chapters 4 and 5, school structures left me isolated from my peers and overwhelmed by my teaching load – all of which left me precious little time to reflect on my practices with others (or even on my own!). At a time when teachers are being held “accountable” for their students’ failures, it is more difficult than ever for a teacher (especially urban teachers) to engage in an open dialogue with others about his or her weaknesses – effectively preventing any possibility for dialogues about how to make change.

As next-door-neighbors and co-workers in the same department, Linda and I spent a considerable amount of time together. Before inviting Linda to join me as a teacher-

researcher in the DUS project, we often discussed issues concerning our classes, our students, and our relationships with other faculty members. We shared lesson plans, discussed curriculum for our common eighth grade courses, and lamented our situation as floating teachers asked to teach out-of-field. Our conversations, while sometimes therapeutic and cathartic in nature, lacked the critical reflection and objective evaluation that is characteristic of cogenerative dialogue – a fact that made our “teacher talk” seem unconstructive and ineffective. However, as described in the previous section, our participation in conversations in the field of the weekly DUS seminar meetings were enabling us to (little by little) gain the dispositions we needed to continue to critically co-reflect on our practices in our individual classrooms as we engaged in informal cogenerative dialogues in our daily lives – many of which took place as we traveled to and from school.

One morning on our subway ride to school, Linda shared with me a “finding” from her classroom research that was significant in demonstrating to both of us the real transformative potential of our participation in this research. For some time, Linda had been bothered by the fact that some of her students turned in incomplete exams even while they had time remaining to finish. In a cogenerative dialogue with their four student researchers (one of whom turned in an unfinished exam), Linda and Stacy discovered that many students felt compelled to turn in their exams soon after the first student “finished” their test even if they had not answered all the questions for fear that their peers would think they were “not as smart as those who finished sooner.” Linda’s testing practice presented a contradiction to student achievement as these girls felt it necessary to sacrifice their grades to preserve the perception among their peers that they were “smart” – something that was very important at Urban Magnet. In an effort to remove this contradiction, during the next exam Linda instructed her students to remain in their desks, to turn their exams over when they were finished and to “doodle” on the back until she collected the exams. This simple change in her teaching practice allowed all of her students to complete their exam. In addition, by asking students to draw on the back of their exams until she collected them, she made it more difficult for the students to determine when someone had “finished” because they were all instructed to continue writing until Linda collected the exams.

This event was salient in enabling me to see how this research could allow me to make immediate changes to classroom structures because it provided me with a non-threatening example of how a relatively simple change in Linda's teaching practices increased the learning potential of her students. Furthermore, this change was a result of a cogenerative dialogue Linda had with students about wanting to change her practices so that more students could be successful in her class. Recognizing that this change was a direct result of student input, this cogenerative dialogue was influential in helping me see student contributions as valuable and valid. Prompting the first of many "subway" huddles, this event encouraged us to continue to compare our research findings while reflecting on our evolving roles as teacher-researchers of our own practices. As our participation in the weekly DUS seminars continued, we were exposed to new theories and vocabulary that we introduced into our discussions, providing us with new resources in the analysis of our classrooms. These tools reinforced our belief that this mutual reflection and discussion was legitimate and important, which strengthened my conviction that I was engaged in research – not gossip.

Huddles between Linda and me occurred frequently, usually starting on our subway ride to work and continued all throughout the school day during short phone calls and impromptu visits to one another's classrooms while teaching and/or during our individual prep periods. Sometimes these discussions spilled into the science office where we would be joined by Stacy, Sarah-Kate and/or even Mrs. Costa (our science department head). Due to the time constraints imposed by our individual floating schedules, our conversations were often short and almost always interrupted by our need to complete other tasks at the same time (including prepping for lab, eating lunch, calling parents, or grading papers). Our discussions generally revolved around our emerging research interests, content and curriculum development, and our social interactions with students both in and out of school. The latter of which was of particular importance for me in connecting with some of the girls in my chemistry class who I had never taught before and who were not in my advisory.

6.3.2 From Hoops to Huddles – Exchanging Capital During Cogens

As mentioned in chapter 4, Linda was also the junior varsity girls' basketball coach. In this role, Linda (who enjoyed a great deal of social and symbolic capital with her

players) could interact with many of my chemistry students in an environment removed from the classroom. Since Linda and I usually traveled to and from work together every day, I could interact with some of my students outside of the classroom while they waited for their parents to collect them after practice and games. Interacting with these students after school, I began to recognize the social, cultural, and symbolic capital that many of them held with their peers outside of the realm of my science class. This was particularly true with a student named Jamie. Having only encountered Jamie in the chemistry classroom, I characterized her as a self-conscious, timid student who needed constant encouragement from me that she could *do science*. However, in the gym (far from the science classroom), I found Jamie to be a confident, vivacious, and determined athlete. She was well respected by her teammates and peers and she emerged as a real leader on the court – being voted team captain by her teammates. Seeing Jamie on the court, it was hard for me to recognize her as the same person in my chemistry class. After speaking to Linda about the differences I noticed in Jamie’s confidence levels in chemistry and basketball, Linda reported that initially she too found Jamie to be lacking in confidence – requiring a lot of positive reinforcement. Having developed a strong bond with Jamie in her role as coach, Linda offered to bridge the gap between Jamie and me by inviting her to come and speak to me after practice about our research and our shared concerns about her performance in my class.

Participating in my first cogenerative dialogue with a student from my class, Jamie confided that she felt more confident in basketball because she knew how to act and what to expect in practice; however, in chemistry class she felt uncertain about my expectations because she did not understand my general “game plan.” She continued by saying the discomfort she felt in class prevented her from asking or answering questions even when she was certain she knew the “correct answer.” Encouraged by both Linda and me, Jamie arranged to meet me after basketball practice to go over her homework problems for the following day. While going over the assignment, Jamie told me she felt most confident in class when she knew the agenda for the day. I told her that as a student in the MCE program, I often felt the same way and I believed this seemed like a reasonable request that I could immediately implement²⁶.

²⁶ Video analysis of the first five minutes of every taped class period occurring after this conversation with Jamie reveals that I always provide students with a “quick review” of the class lesson plan which

Prompted to share more, Jamie offered that she often had questions during class, but felt embarrassed to ask them, even though I encouraged students to “ask if you do not know.” Brainstorming together to find ways to make her feel more comfortable in class and to help her gain the confidence we both felt she exhibited on the basketball court, Jamie and I decided to meet more frequently after school. To boost her confidence in class, Jamie and I arranged for me to call on her to answer questions only when she volunteered because she said she felt paralyzed when I called on her without notice. The next day in class, Jamie answered one of the homework problems we had worked on together after school. As the school semester progressed, Jamie became a permanent fixture in the science office and adjoining classroom as she worked on her homework problems after school. During my first report card conference with Jamie’s mother (who was also a teacher), she expressed her sincere gratitude for my reaching out to Jamie – saying her daughter always did best in classes where she made a personal connection with the teacher. Thus, while my first cogenerative dialogue with a student occurred on a small scale, it was beneficial because it helped me to see how easily I could introduce structural changes to afford student agency. However, as is often the case, these structural changes brought about new complications and contradictions that would need to be addressed.

6.3.3 Learning to Structure Change

My arrangement with Jamie encouraged her to exert her agency both inside and outside of class, making certain she had access to me as a resource for her learning in an arrangement that was most beneficial to her. Finding me a useful resource, Jamie became more and more aggressive in seeking out my help – to a point where I sometimes felt hounded by her persistent need for attention. Over a short period of time, this became problematic. Because I had much to prepare for my four preps

I either wrote on the board or more informally announced to students. Audio and video transcripts of numerous student interviews and cogenerative dialogues indicate this practice was appreciated because it helped focus their attention for the period – helping them organize their thoughts and notebooks. In the following transcript from a February 6, 2002 cogenerative dialogue between Yanque and Sarah-Kate, Yanque describes how she experiences the beginning of each class period : “Um, well she usually gets settled down quick and then she’ll try and get us settle...She’ll kind of give us a brief outline of what we are going to do. She’ll say, ‘first we’re going to talk about what we did in lab yesterday and then we are going to move on to’ And I like that because some teachers don’t tell you what we’re doing and everything gets mixed up.” Before my conversation with Jamie, I sometimes informed students of my plan for the period, but this practice was inconsistent. Unlike many of the structural changes I made in my chemistry classroom, I implemented this new practice in all of my classes.

each day, I felt robbed of one of my most valuable commodities: time. Already spread thin, our co-constructed solution left me feeling panicked after the first month. Unsure whether future cogenerative dialogues with my students would necessarily result in me being asked to fulfill an impossible role, I became concerned with the feasibility of being able to sustain such changes over time. Would these cogenerative dialogues be necessary with every individual student in my class? In each class? Would I need to make individual allowances for each child? Was this even possible? Fortunately, multiple overlapping fields of cogenerative dialogue enabled me to address this new contradiction with others, allowing me to co-construct new structures that better supported both my agency and Jamie's.

6.3.4 Four Heads are Better than One

The above vignette provides an example of structural changes in my classroom teaching practices that was recursively tied to a conversation with one student in particular. The full potential for affording the agency of more than one student in the classroom may have been lost had I not had the opportunity to reflect on these co-constructed changes (and their resulting effects) with Linda, Sarah-Kate, and Jamie. Later in this chapter, I elaborate on the importance of huddles with Sarah-Kate (and students) in the classroom, but it is important to note here that as a participant in the classroom, Sarah-Kate was able to alert me to the fact that my increased interaction with Jamie was decreasing opportunities for other students to interact with me. The following entry in my field notes demonstrates how Sarah-Kate's participation in the classroom (coupled with video analysis) provided me with another lens from which to consider my classroom practices.

Today Sarah-Kate called me to the side of the class to ask me if I knew how long I had been working with Jamie and Tony. I admitted I had not given it much thought, but after counting the number of students with their hands raised, I decided that I should. I returned to Jamie's table and arranged to meet with her after school to continue to answer her questions because I needed to make sure I spoke with more students in the class (field notes, December 2001).

Our conversations occurring immediately after chemistry class provided us with some of our richest opportunities to discuss the structures that were being exposed by our research. Sarah-Kate was a relatively new addition to our classroom in December, and as such, she did not know about the arrangement I had made with

Jamie after our cogenerative dialogues. Moving from the hallway to the science office, Linda became involved in our discussion. I commented that although my after-school work arrangement with Jamie was obviously improving her performance in class, I was frustrated by the amount of time and energy it required of me on top of my already impossible schedule. I confessed I was embarrassed by the frustration I felt because it made me feel selfish and unsupportive of a student who needed me. I always had a few students with whom to work during lunch and after school, but my relationship with Jamie was more than that. I felt that her knowledge of the purpose of the research (to improve my teaching and her learning) coupled with our conversations had invited a familiarity and sense of entitlement to my time with which I was not all together comfortable. Other science teachers teased me in the afternoons by announcing, “Jamie has arrived for her private lesson.”



Figure 6. 2 Jamie and Tony both raise their hands to call Sonya to their table.

On top of this, Sarah-Kate (as a participant observer in the classroom) informed me that she felt I was spending a disproportionate amount of time with Jamie during class as well. To verify this assertion, Sarah-Kate decided to analyze some of the videotapes Stacey had taken of my class before Sarah-Kate transitioned into the classroom. Rarely interacting with me in class before our cogenerative dialogue in early October, video analysis of one 50-minute tape taken on October 25, 2001 showed a noticeable change in Jamie’s practices as she and Tony repeatedly called me to their table to assist them (see Figure 6.2 – seen in the upper right hand corner – both Jamie and Tony’s hands are raised).

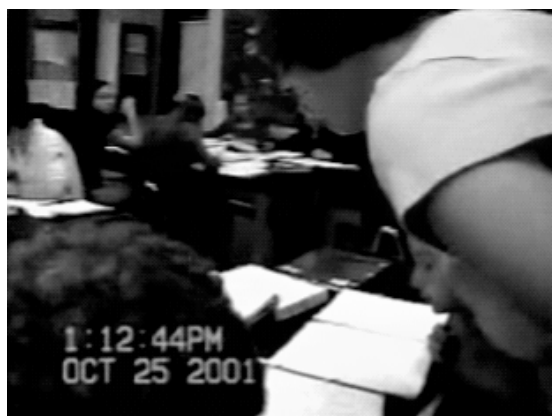


Figure 6. 3 Sonya working with Jamie and Tony while other students raise and lower their hands to ask for assistance.

Video analysis by Sarah-Kate revealed that I spent nearly 17 minutes of the class period helping Jamie and Tony, meaning I was engaged in one-on-one teaching during one-third of the class period, effectively ignoring the needs of the 24 other students in the room. Reviewing the tape with Sarah-Kate, we noticed that while working with Jamie and Tony, several students raised and lowered their hands in anticipation of gaining my attention, but to no avail (see Figure 6.3; student in upper left corner is lowering her hand as I continue to work with Jaime and Tony).

Because my recollections of what transpired during this class period were so different than what was presented on the video²⁷, I was shocked to see how long I spent with Jamie and Tony and how few students I noticed needing my help. Following our conversation, Sarah-Kate and I decided it was important for me to be conscious of the amount of time I spent with each student and the frequency with which I worked in different groups so I could prevent any one student or group of students from monopolizing my time²⁸. As a result of re-viewing tapes of the class with Sarah-Kate, I informed students that I noticed I did not circulate around the

²⁷ Using data resources (such as transcripts and/or video clips) as a focal point during cogenerative dialogues was an important development in our research. Engaging in conversations about a specific event made our discussions more meaningful because we could point to a certain scenario in which something occurred. This allowed us to deconstruct the event as it unfolded while considering lots of possibilities for the way we acted as well as how we could change in the future.

²⁸ Video analysis of Jamie and Tony's interactions before and after my working with them revealed that Tony (a student with a learning disability and Individual Education Program in this class) was greatly benefiting from these interactions because he listened on as I spoke with Jamie. In addition, because I was spending more time at his table – building social capital with him during these interactions – he increased his participation in the lessons, asking and volunteering to answer questions, and even serving as a peer teacher for Jamie. Before viewing video of their interactions, I had assumed that it was Tony who was benefiting from Jamie "working with him," but he was actually an equal contributor to their group. This information challenged my assumptions about Tony's understandings of chemistry.

room as much as I would like. I told the class I would try and be more cognizant of the time I spent working with each table and invited both Sarah-Kate and my students to remind me to keep moving around the classroom if needed.

6.3.5 Rethinking Change

The previous vignette demonstrated to me that making change was easy, but making successful change would require a great deal more effort and forethought on my part. By transforming classroom structures to afford Jamie greater agency in the classroom, I inadvertently truncated the agency of both her classmates and me. In an attempt to re-distribute resources more evenly, Sarah-Kate and Linda suggested that Jamie and I refine our work plan both during and after school. From the video, I now knew that more students had unanswered questions during class, so I started announcing more frequently that I was available both before and after school for students who required extra help or more time to work on problems. As more students started asking for help, I enlisted a large number of juniors and seniors from my past two chemistry classes to act as tutors (I was even able to get the administration to accept chemistry tutoring as a legitimate community service program so that would fulfill volunteer hours for upper classman). In addition, I instituted a study hall for chemistry homework and questions during eighth period three days a week which students (such as Jamie and Tony) attended with great frequency for the rest of the year. Scheduling this study session in a free classroom, students were able to “float” in and out for help very informally. I asked that a few upperclassmen “hang out” in the class with me during this period to offer their services in a relaxed and inviting setting. Students were allowed to bring food and drinks to this session and were encouraged to come for any amount of time they could.

These adjustments meant that I was available for more students during a set amount of time each week while providing them with more resources than were previously available resulting in increased agency for more students than just Jamie. Feeling less pressured to meet the individual needs of each student all by myself, I felt less frustrated in my relationship with Jamie and was pleased to find that she enjoyed having multiple tutors because they provided her with a larger number of perspectives from which to view chemistry. These changes expanded my agency as a

teacher by providing me with a variety of ways to better support the learning of my students without draining me of my time. In addition, some of the students who sought upper classmen to tutor them in chemistry asked for assistance in other subjects such as math and Spanish. At a school where students were generally reluctant to ask for extra help in any subject, this structural arrangement enabled students to utilize resources without jeopardizing their social and symbolic capital with their peers. Finally, I found that students were not the only ones to benefit from this arrangement as it provided me with a social space to interact with students in a different way than I normally did in the chemistry classroom, thus helping me to continue to build social capital with students and gain symbolic capital with students and their parents as a teacher who really cared. In addition, this informal socialization provided me with a way to keep my “pulse on the classroom” because it allowed me to gather information about student understanding of material I was covering to help me better address and/or re-teach these issues during whole class.

6.4 THE SPIRAL AFFECT OF OVERLAPPING FIELDS

In previous sections, I demonstrated the ways in which my participation in cogenerative dialogues with multiple participants where we discussed the same events in my classroom enabled me to construct a richer understanding of the problems I faced. Developing my understanding in these overlapping fields helped me to co-construct new structures in the classroom and the school that afforded the agency of a greater number of students because – through cogenerative dialogue – I was privy to the perspectives of a wider audience than was previously available to me. Overlapping fields provide participants with multiple opportunities to grapple with an issue over time, allowing participants to track the evolution of their thoughts (both individually and collectively) about structures and experiences. This is important for two reasons: these discussions allow a person to encounter ideas from differing perspectives over time while simultaneously providing them with multiple instances (with a variety of people) to re-construct and “try out” their evolving understandings. As participants continue to engage in conversations with others over time, their collective understanding becomes a resource for other conversations – creating a spiral of connected ideas across fields (see Figure 6.4).

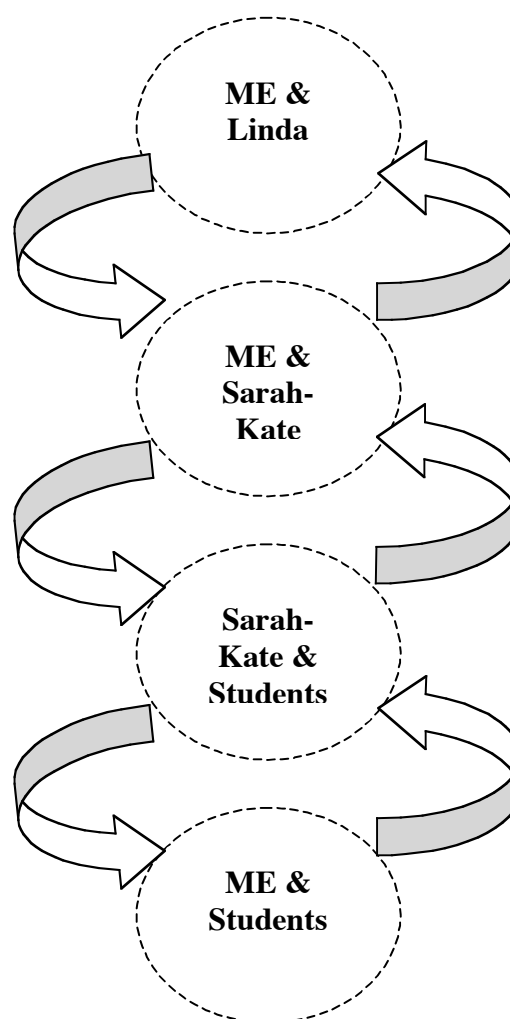


Figure 6. 4 Central issue spirals through each cogenerative dialogue – serving as a resource for all other conversations over time.

This spiraling of ideas through multiple fields of cogenerative dialogue will be used throughout the rest of this chapter and the next as I track the development of three themes that continuously cycled through our overlapping fields of cogenerative dialogues. These themes emerged as a major focus of our conversations in each field and were driving forces in our research as we analyzed and changed classroom structures. Specifically, I explore our changing understandings of the importance of questions in the classroom, the roles people take in class and how these roles contribute to the development of collective responsibility for learning, and the importance of developing strong relationships between students and teachers as a means of facilitating the first two themes mentioned above.

6.4.1 When One Question Leads to Another

The following vignette provides an example of how my involvement in cogenerative dialogues with different participants in multiple fields over time served as a resource for my evolving understandings about teacher-student interactions that led to a number of important structural changes in my classroom. While not immediately apparent, the vignette previously described provided fodder for future discussions with Linda and Sarah-Kate concerning the importance of teachers questioning practices in the classroom. Sharing with Linda the result of my cogenerative dialogues with Jamie after school, I expressed my frustration that even while encouraging students to ask questions, many still felt unable to do so. I explained that while circulating around the room, I noticed students often held their pencils poised above a blank page with no idea how to begin a problem – yet they rarely asked me for assistance. Linda commiserated, saying she often felt the same frustration. Before our involvement in this research, this may have been the end of our “teacher talk,” but Linda and I were now actively engaged as researchers – we were looking for ways to improve our teaching. Armed with a new appreciation for sociocultural theory and an analytical framework that encouraged us to resolve contradictions, Linda and I continued our conversation. The following is an excerpt from my field notes taken while talking with Linda in the science office as we contemplated the importance of questions and questioning in the classroom.

So, we ask students do they have any questions. No one answers and we move on. Linda said she knows they have questions – we can tell by their blank faces. So why don’t they ask the questions they have? Capital? Are they afraid they will lose face in front of their peers? So – if we know they have questions – but cannot ask them – what do we do to help them? Maybe it is in how we ask. Remember to look at how we pose questions and student responses. (Field notes, Friday November 2, 2001).

As is evident by the questions raised in this discussion, Linda and I were attempting to apply the theory we were learning about in our DUS research meetings regarding capital exchanges to our present conversation in which we were considering the role of losing and gaining capital while asking and answering questions in the classroom. We were also reflecting on *our* role as teachers in encouraging students to ask questions. My frustration with how to get more students to ask questions in class prompted me to consider my questioning practices both as a teacher in my class and as a student in the MCE. Now used to examining the social and historical contexts of

issues, Linda and I recalled our own actions as students in science and decided that even when *we* had questions in class, we often did not ask them during class and rarely felt comfortable approaching our professors outside of class. It seemed we were not very different from our own students. But what could I do to address my concerns? I did not feel I could sacrifice class time to hold this sort of discussion, but I felt it was important to find out how students felt about class and how I could encourage more participation. Fortunately, Sarah-Kate's weekly research meetings and cogenerative dialogues with students provided fields in which these questions could be considered.

6.4.2 Putting the "Co" in Co-researcher

Before meeting with student researchers, Sarah-Kate and I met for our first cogenerative dialogue where Sarah-Kate asked me what some of the things were that I was interested in looking at in my classroom. She began this discussion by telling me "you are the expert on your kids and your class" and that she felt it was "important that you be involved in providing ideas for the research." I found it somewhat intimidating to imagine providing direction for our study, but I also felt empowered. I shared with Sarah-Kate the conversations I had been having with Jamie and Linda about student comfort with asking questions and she offered "that is a great place to start!" Based on experiences as a participant in the classroom and our overlapping cogenerative dialogues in which issues about questioning had arisen – we developed some questions for Sarah-Kate to share with our student researchers to help us examine student comfort and questioning practices.

As detailed in chapter 2, I was often not available to attend the research meetings and cogenerative dialogues that Sarah-Kate and the student researchers held each week. Neither my students nor me thought this was particularly problematic at the time because we had Sarah-Kate to bridge the gap between us²⁹. For the present, we were all comfortable with Sarah-Kate's role as the university researcher to help us negotiate our changing roles as teacher- and student-researchers. Sarah-Kate met with a group of student researchers to discuss with them what we (Linda, Sarah-Kate, and me) had all been considering. She asked students for their thoughts about

²⁹ However, this arrangement did offer some interesting and difficult contradictions in our research and relationship near the end of the year when Sarah-Kate's schedule made her absence more frequent. This issue is discussed in greater detail later in this chapter and in chapter 7.

what made a student feel he or she can ask questions in a class and how he or she felt about our classroom in general. Afterwards, Sarah-Kate and I met again to review, add to, and re-word some of the questions that she and the student researchers developed. The following table (6.1) illustrates some of the questions that emerged from these two conversations that provided the early focus of our research.

Table 6.1 Co-generated Research Questions

1. What are positive teaching strategies used by Ms. Martin? Negative strategies?
2. What are positive learning strategies used by students? Negative strategies?
3. How do you feel about science? How do you feel about your peers? This class? How do these feelings affect the way you interact with Ms. Martin? Your peers? Science?
4. How do you feel about other subjects or classes? How do they compare to chemistry class?
5. How is this class similar to other classes? How is it different?
6. How do you feel about activities in chemistry? Assessment practices?
7. How do all of these things contribute to your level of comfort in the classroom? How does how you feel affect your ability to participate in class? To ask/answer questions?

These questions served to focus our lens in class as we began to consider our individual practices and interactions with one another and how these practices and interactions affected the whole class. In addition, they provided a common thread or focus to our individual conversations with one another: Sarah-Kate with me, Sarah-Kate with students, and students with students. In the following section, I provide examples of how these fields overlapped, focusing first on the field of Sarah-Kate and student researchers, followed by the emerging field of students with students. However, in the next chapter, I revisit the field of cogenerative dialogue between Sarah-Kate and me (both in and out of class) before transitioning to a focus on my students and me in cogenerative dialogues in the classroom.

6.4.3 Students – Co-generating Change as Co-researchers

As described in chapter 2, Sarah-Kate met with small groups of student researchers two and three times a week, usually during their 50-minute lunch period in any empty classroom they could find. During these meetings, Sarah-Kate and students analyzed video, compared field notes and classroom observations, and discussed the direction of our research. In the following vignette, Sarah-Kate and Yanque are using the questions from Table 6.1 to focus their analysis of videotape from classes.

Students are searching for patterns of coherence and contradictions by identifying strategies they felt exemplified “good teaching” or “bad teaching” on my part and “good learning” or “bad learning” on their part. I also reviewed these tapes in an attempt to identify such practices. The following is a transcript from a February 2001 cogenerative dialogue in which Yanque shares with Sarah-Kate what she has identified as a good teaching strategy in her analysis of a recent class.

- Sarah-Kate What else do you think makes her [Ms. Martin] really understanding to student needs?
- Yanque Well, she always says, she’s like “when I was in school you know.” She’s like “I understand how the teacher *was* and then she talks about how she is doing this study or is a student or when she was a student teacher, so she understands how we are [feeling].

Yanque offered that by sharing my personal experiences with students (such as the difficulties I faced in my chemistry classes in the MCE program), I gained social capital with them, which in turn, made our interactions more constructive because they understood I respected them and wanted to connect with them in an effort to improve our classroom. After this conversation, I met with Sarah-Kate where she shared Yanque’s analysis with me. We decided my practice of sharing personal experiences afforded student agency because it enabled them to see me as someone who could identify with their struggles and with whom they could share their concerns. Being privy to this conversation and student comments such as Yanque’s offered me, an opportunity to learn more about their needs as students, and their likes and dislikes – while simultaneously providing me an opportunity to share more with them my own needs, likes, and dislikes. More importantly, this feedback enabled me to consciously examine my practices that students found both benefited and limited their learning. Continued discussions with students, Sarah-Kate, and Linda enabled me to consider which structures to change, which practices to strengthen, and which practices to try to diminish.

During research meetings, Sarah-Kate talked to student researchers about research methods, including how they chose the students they interviewed. Chandra and Yanque identified students they felt represented a range of students in the class: students from the “top of the class, middle, and bottom.” They also chose to speak to students who they felt both enjoyed class and that struggled in class. Using this method, student researchers presented the perspectives of a cross-section of class.

During a research meeting with Sarah-Kate, Yanque shared a transcript of a conversation she had with a peer about our classroom using the questions from Table 6.1 to focus their conversation. Students reported that their ability to have student-student conversations without adults present was particularly important in helping them feel they were “really doing research too.” In addition, students felt these conversations allowed them to share some issues with us that were harder to say when we were all in direct contact with one another. Cognizant of the power structure inherent in our teacher-student relationship, Sarah-Kate and I offered students the option of submitting transcribed discussions without student names. We felt this practice would encourage students to really share their views of class without feeling worried about possible “teacher retaliation.”

The practice of removing student names was used more often in the beginning of the research, but over time, students said they did not mind their names being revealed because they felt comfortable that me knowing “who said what” would not negatively affect our relationship. However, these early transcriptions without student names were some of the most powerful for me to read because I was able to reflect on how students viewed class without attaching a particular student to the comment. The following is a transcript of an early student-student conversation using questions from Table 6.1 to focus their discussion. To preserve anonymity of the students in this conversation, Yanque transcribed this February 6, 2002, audio taped discussion without student names, using I for Interviewer and S for student.

- I: Are you afraid to ask questions in chemistry class?
- S: Well usually, my question's usually answered before I have them. I mean before I have the chance to ask.
- I: If you get confused, do you raise your hand and ask questions in chemistry class?
- S: I usually ask people around my table first and then if none of the people know then I ask Ms. Martin.
- I: When you think about going to chemistry class, like what kind of feelings, you know, are you overcome? What kind of feelings do you get?
- S: Usually I don't, kind of like, I don't want to go. Just sometimes I don't feel like working, that's for like any class, but especially for chemistry because sometimes, well usually I really don't know what I'm doing.
- I: Do you think, oh, I want to have fun, or, do you think, I'm going to get so much more confused?
- S: So much more confused and more work and everything.
- I: Do you think that chemistry is exciting or just more information that's hard to understand?
- S: No. I don't think it's exciting. I mean, maybe for some people but, it's just, I don't know.

- I: Do you think Ms. Martin does a good job of teaching us?
- S: She makes it seem more interesting sometimes but it's kind of hard to make it interesting when she's doing a long lecture or practice problems or something.
- I: What do you consider your best method of learning? You know through speech, hands-on, visualization, reading.
- S: Probably visualization or hands-on cause it's kind of hard to like memorize stuff that she just tells us.

Reading this audio transcript opened my eyes to a lot of things I was unaware in my classroom. Before reading these student conversations, I had never thought much about how my students felt about chemistry or science in general. It did not really occur to me that some students may not like the subject and may not enjoy the course for this reason. This seems like a pretty naïve notion now, but at the time, I was disappointed to find out that even one of my students was not as enthusiastic about chemistry class as I was. Echoed in transcript after transcript, students continually touched upon the importance of their peer groups in the classroom. The following transcript is from a December 2001 conversation Chandra had with a student she chose from the “middle of class.” Chandra also chose to provide this student with anonymity by providing only a first initial in her transcript.

- C: How is your class set up? Do you talk a lot? Where do you sit, etc?
- E: I don't think we talk a lot in class outside of work. I (laugh) don't think Ms. Martin puts up with talking – (laugh) I know she doesn't. Usually I sit with my friends. I sit with people I know so if she gives us time to do things, like work on questions, it will be easier.
- C: Your friends – how do they affect your enjoyment of the class?
- E: Uhm. I think it is good to be around people you know so that like, uhm, if Ms. Martin does something crazy (laugh) or funny or something, it is always good to laugh with people you are used to laughing with. I don't feel like I talk to them during class though. (2.0) It's just like a lunchroom, you sit with who you are most comfortable sitting with.
- C: It is interesting that you compare it to sitting in the lunchroom. How does chemistry compare to your other classes?

I feel that this transcript provides an accurate representation of my conflicting desire to have students enjoy themselves in chemistry, but not at the expense of me losing control. By my third year at Urban Magnet, I no longer assigned student seating and I encouraged students to sit with someone with whom they felt they could work well – but always with the threat that they would be separated “if needed.” I still needed class to look a certain way in order for me to feel comfortable, but our analyses of numerous transcripts (such as the ones provided above), video clips, and cogenerative dialogues were making it necessary for me to reconsider how to

increase student comfort while preserving my own. Cogenerative dialogues offered my students and me a pathway to do just this.

6.5 STRUCTURING SOCIAL TIME AS A TIME FOR CHANGE

Focusing our early conversations around video analysis of classroom activities benefited Sarah-Kate, my students, and me by helping us to gain familiarity and comfort with analyzing classroom interactions in a very informal and relaxed environment. While we talked about a range of issues in cogenerative dialogues, analyzing the social dynamics that existed between my students and their peers and my students and me, emerged as a major focus. Doing so eventually facilitated a better understanding of not only my teaching practices and the structure of the classroom, but also how these two factors shaped my students' experiences in class (with their peers, with me, and with science). In this way, cogenerative dialogues provided a social space for us to interact with one another in a structure that encouraged us to develop different social interaction patterns than were fostered by the more traditional structure of school. The dispositions we each gained during these conversations (and in other overlapping fields of cogenerative dialogue) were crucial in that they provided a structure for renegotiating our roles both in and out of the classroom. Changing the social dynamics that existed between my students and me was the first step towards co-constructing a new learning environment.

6.5.1 Is That How I Look to Others?

While providing opportunities for strengthening our social ties, cogenerative dialogues also provided a safe space for us to begin the difficult process of self-reflection and analysis of classroom interactions and practices. Because most of our early conversations focused around watching and discussing video from class, it was important that we become accustomed to seeing ourselves on video by viewing and re-viewing tapes both by ourselves and in the company of others. At first, we were all uncomfortable watching ourselves on tape because we were concerned with superficial issues, such as appearance. For this reason, our first analysis session consisted of many comments such as "look at my hair" or "my voice sounds so weird." These distractions made it difficult for us to concentrate on analyzing what was happening in class instead of focusing on how we looked on screen! Becoming acclimated to watching ourselves on video took time, but it was necessary for our

analysis sessions to be productive. For this reason, Sarah-Kate urged both the student-researchers and me to take tapes home to view them a few times alone before coming back to the group to discuss what we thought was occurring in the classroom.

The process of reflecting on our practices “after the fact” and outside of the classroom allowed us the opportunity to critically examine our practices without the emotional limitations that would restrict us from being critical of our practices “in the moment.” Reflecting on my practices in a safe and non-threatening environment took the pressure off me as the teacher to maintain the façade of being infallible in the classroom. In addition, this process provided me the space to *re*-consider my actions by myself first before entertaining the constructive criticisms of others, as well as sharing with others what I thought were my own shortcomings. Informed by sociocultural theory, my students and I were asked to reflect upon practices that we thought contributed to the structure of the classroom and the ways in which our practices both afforded and truncated the agency of others. Provided with a common vocabulary with which we could analyze classroom interactions, my students and I became accustomed to analyzing our practices and interactions in a constructive manner that supported our continued efforts to be critically aware without being critical of any one person³⁰.

6.5.2 *Getting the Rest of the Story*

Many of the conversations my students and I had with one another in the early stages of this research, while not necessarily recognized as “official” cogenerative dialogues, were instrumental in helping us gain confidence in the research process and in the more formal process of cogenerative dialogue as they were initially defined. As these tools were being introduced to us, daily social life continued with parent-teacher conferences, group assignments, peer interactions, etc. These everyday interactions, while not identified as cogenerative dialogues, were occurring constantly and, in retrospect, can be viewed as one of the many small steps that enabled us to gain confidence individually and collectively in the potential for

³⁰ Discussed in greater detail in the next chapter, student evaluation of their peers was generally very supportive with the exception of one student in particular. This contradiction first appeared during student cogenerative dialogues and then transferred into the field of the classroom where students became very critical of the practices of one high-achieving student. Fortunately, cogenerative dialogues provided a space for this contradiction to be addressed and resolved.

change through these experiences. As students and I participated in these cogenerative dialogues over time, we became more comfortable with one another and with the goals of the research. This level of comfort was important in helping establish a space in which we could make suggestions and comments to one another that were sensitive in nature and often outside the realm of “science.”

In this way, cogenerative dialogues enabled my students and me to become more comfortable sharing personal stories, discussing sensitive issues, and laughing at one another without risk of losing social and symbolic capital. This relaxed atmosphere provided us with a way to “get the rest of the story,” meaning we were comfortable enough with one another to share information that students and teachers are generally not privy about one another. We became accustomed to sharing with one another details about life both “inside and outside of class.” Our conversations enabled me to be aware of the little nuances in student social interactions that held meaning for them, but not necessarily for me (such as laughing or groaning when certain students spoke, etc.) In addition, these conversations allowed us to recognize one another as real people with life commitments (such as sports) and social concerns (such as peer and familial conflicts) that shaped and/or limited our participation in class. The following video image (see Figure 6.5) and associated vignette is taken from a cogenerative dialogue to illustrate this point. Sarah-Kate and five student researchers are participating in this conversation as they analyze peer interactions on a video from a previously recorded class. (The television they are viewing is located to the right of the group).



Figure 6. 5 Exchanging capital and dialogue.

This meeting took place in my classroom during a lunch period in which I was working with students from my senior Biology class while also attending a science faculty meeting in the adjacent room³¹. Although unable to join formally this cogenerative dialogue with Sarah-Kate and the student researchers, I interacted with the group as a peripheral participant. Because I had developed a strong relationship with all of these students both in class and in less formal settings such as lunchtime meetings, cogenerative dialogues, and other school related events (such as sports, club activities, etc.), I was able to float in and out of the conversation without difficulty.

In the instance above, the student seated to my right had just jokingly commented that this was a great tape for her to review because it was “one of the few times I actually completed my homework” and “knew what was going on.” While walking over to join the group, I joked that it was a memorable day for me for the same reason. This caused a great deal of laughter from the whole table as we continued to watch Erin while she answered and asked several questions in her group – reinforcing the fact that she had come prepared to class and was able to participate fully in supporting her group’s learning. In this relaxed setting, cogenerative dialogue provides a space for teachers and students to share social interactions and engage in capital exchanges that are not easily accessible in more traditional student-teacher relationships where a greater social distance between teacher and student is generally maintained³².

The capital exchanges that occurred between my students and me during cogenerative dialogues could, due to the porous nature of fields, cross into the classroom providing us with a continued feeling of positive emotional energy and

³¹ As noted in chapter 2, weekly cogenerative dialogues with this group occurred on Wednesdays during third period lunch. Science faculty meetings were scheduled for the same period, so my participation in the Wednesday cogenerative dialogues between Sarah-Kate and my students was limited.

³² My participation in this research made clear to me the importance of socializing with students before, during, and after class. Supported by video analysis and field notes, as the school year progressed I spent more time before, during, and after class interacting and “socializing” with students. This is in marked contrast to the video I submitted to the Masters of Chemistry Education (MCE) program from my first year at Urban Magnet in which I ended class by telling students to “Make sure you get here on time tomorrow. We only have 50 minutes and we have a lot of material to cover in a short time.” As I bought into the idea that social time benefited our learning environment, I spent more time during each class period interacting with my students, asking about their sporting events, their families, or talking about a recent movie, etc.

solidarity that afforded us greater agency in the classroom as we continued to re-negotiate our roles and goals as teacher and learners. In addition, the relaxed and less formal setting encouraged honest discussions. Following our comments about Erin's participation, Sarah-Kate and the other student researchers discussed some of the factors that prevented students from coming prepared to class, including inability to juggle numerous outside commitments (e.g., sports, after-school jobs, and other coursework) and the nature of assignments (perceived relevance or importance of assignment and/or access to necessary resources to complete assignments). By exposing issues that prevented students from fully participating in class, we could begin to address the structural changes necessary to increase student participation. For example, I learned that a large number of my students neglected to do homework assigned on Tuesday nights because they had exams in two other classes scheduled every Wednesday – so I stopped assigning homework on Tuesday nights or negotiated shorter assignments that students felt they could complete in 20 minutes or less. Again, even though this was a small change, it represented a promise for greater changes in the future.

6.5.3 Emerging Themes as Sites for Change

Data analysis of student conversations, video interactions, and cogenerative dialogue allowed us to identify several issues of importance to students: students often relied on their peers for help, they enjoyed working in groups, they found it difficult to follow long lectures, they learned best when given access to visuals, hands-on activities, and other material resources. While it is true that I did not need this research to understand that my students generally enjoyed these types of interactions and activities, it was not until I was provided with multiple accounts in which students expressed the importance of these activities in providing them with a sense of comfort and confidence in their efforts to learn chemistry that I could appreciate how important these activities were. It is also important that my students were learning about their peers during these conversations. As students voiced their beliefs about class and about what best supported their learning, they found they were no longer isolated in their struggle to learn chemistry. Engaging in these dialogues with one another, they discovered things not only about one another, but themselves. They began to identify strategies they felt supported their learning and shared them with their peers. During class, students could be heard saying “what strategy do you find

helps you to” and “one strategy I use to remember this is.” This is yet another instance in which our individual findings became collective knowledge when we shared our understandings with one another through our overlapping cogenerative dialogues. In so doing, these themes became influential in changing structures in the classroom as we sought to improve student participation, comfort, and achievement.

As the ideas continued to spiral from one conversation to another, continuing in various forms over time with different participants, change and discussions about change started to feed upon themselves in a cycle. We began to strategize about how best to implement change. Afterwards, we would come together again to reflect on the changes we made. Constantly monitoring our changes and our new experiences as a result of change meant that the same issues continued to spiral through all the different fields of conversations that were taking place over time. The porous boundaries of each of these fields provided us all with a structure to support our continued evaluation of our teaching and learning practices and our classroom student-teacher interactions in relation to our experiences in these multiple, overlapping fields – making these conversations more and more powerful as we reflected on the same issues over and over from multiple perspectives. This is where the real potential for change occurs: slowly, over time, and by building on one another’s experiences. In the following chapter, I develop the importance of spiraling conversations by evaluating three recurring themes that emerged from our overlapping cogenerative dialogues: assessment practices, use of peer groups, and the role of student and teacher questioning in learning.

CHAPTER 7

ALTERING THE CHEMISTRY OF THE CLASSROOM: USING COGENERATIVE DIALOGUES TO CO- CONSTRUCT THE LEARNING ENVIRONMENT.

Cultural sociology (Sewell 1992; 1999) sensitizes us to the notion that individuals collectively co-construct the structures of the classroom; therefore, it is important to recognize that the preconceptions my students and I held regarding what it meant to teach and learn science were influential in affording our practices in the classroom. Collins (2004) asserts that the interactions among teachers and students in the classroom are formed and sustained by prior and current interactions with one another. He also states that the emotions students bring into the classroom regarding school, teachers, their peers, and science are influential in shaping the types of interactions that occur. Thus, it is important to recognize that the structures of the school (as described in previous chapters), my schema concerning the teaching and learning of science, and the schema and expectations that students held for teaching and learning all contributed to our experiences in the chemistry classroom. Not until our participation in cogenerative dialogues were we able to gain access individually and collectively to our schema related to science and science education with the purpose of reforming our classroom. In sharing our individual experiences, cogenerative dialogues provided us with a means to expose, evaluate, and, when needed, alter structures in an effort to afford greater collective agency in the classroom.

In the following sections, I describe how these overlapping fields of discussion provided my students and me the dispositions and structures to work together to resolve contradictions that limited our individual and collective agency in the classroom. As outlined in chapter 6, this chapter examines several practices that spiraled through our conversations about how best to re-structure our learning environment to afford greater student and teacher agency. Student assessment, use of peer groups, and the role of questioning were all addressed in multiple fields of cogenerative dialogue over time. I trace the changing structural framework of the classroom by examining these issues in cogenerative dialogues over time.

This chapter provides a macroscopic examination of the structural changes that resulted from our participation in this research and in overlapping fields of cogenerative dialogues followed by a microscopic examination of how these structural changes were experienced by different individuals in the classroom. Specifically, I demonstrate how our collective understanding of these spiraling issues across different fields enabled my students and me to implement and continually re-evaluate structural changes to afford greater collective agency by focusing on the evolving nature of three fields of cogenerative dialogue: Sarah-Kate and me, Sarah-Kate and students, and students and me. By drawing on multiple data resources (including video and audio transcripts, video images, researcher journals, field notes, and student video ethnographies), I provide the voices of multiple participants in the classroom to demonstrate the transformative potential of cogenerative dialogue in science education.

7.1 TALKIN' THE TALK: OPENING LINES OF COMMUNICATION

As my students and I had more opportunities to interact in cogenerative dialogues with Sarah-Kate and one another, we developed a better sense of how to “talk to one another with respect.” Interacting with adults on a regular basis in this way, my students were developing new ways of speaking to adults and being heard by them. In the same way, I was learning how better to listen to my students and make myself heard. We explicitly discussed the ways in which we were communicating, examining the language we used and the manner in which we approached one another. These were important skills for both my students and me because it provided me with different tools for interacting with students in my other classes and it helped some students reconsider their interactions with other teachers and even their parents. Addressed in greater detail in the last chapter, this development presented new contradictions and frustrations for some of the students (and me) as they learned that not all of their teachers were open to developing this kind of relationship with their students.

I found that this increased dialogue between my students and me provided opportunities for me to communicate more fully my expectations for their learning while simultaneously positioning them as more equal stakeholders in their own learning. In addition, this dialogue gave me the opportunity to reflect on my own

practices as a more informed reflector in conjunction with the perspectives offered by my students. It was during cogenerative dialogues that we collectively gained the dispositions and practices necessary to support the “huddles” in which we engaged while teaching and learning chemistry. Throughout the rest of this chapter, I provide more examples of cogenerative dialogues and classroom huddles that support this claim as well as some of the contradictions that occurred as a result of this restructuring of social time between my students and me. In the following sections, I examine how enacting structural changes in the classroom that were co-constructed in cogenerative dialogues provided students with a greater voice in the classroom. This provided each of us with even more opportunities to discuss, suggest, and enact new changes to support their continued learning. Increased dialogue resulted in a shift in the division of labor in the classroom in which students became more active in directing their own learning and how their learning was assessed.

In the following section I introduce several vignettes focusing on a series of changes in my assessment practices that evolved out of a variety of overlapping cogenerative dialogues. Presenting structural changes facilitated in cogenerative dialogues from multiple perspectives provides a means to examine both the coherences and associated contradictions that accompanied each structural change. To describe the extent to which these changes impacted student agency, the remainder of this chapter is dedicated to exploring parallel stories of two students from opposite ends of the spectrum, socially and academically, who experienced these structural changes in very different ways. Through recounting these stories, I address how our experiences in multiple, overlapping cogenerative dialogues, in which we discussed assessment and the purpose of science, the use of groups, and the role of questioning, altered the structure of the classroom and how these changes shaped the experiences of different students.

7.2 TO CREATE A NEW SOLUTION: ADD STUDENTS TO THE MIX

7.2.1 What’s it Worth? A Small Change in the Classroom.

Adhering to the authenticity criteria of our research, Sarah-Kate and I made it a habit to share with students (both in small groups and as a whole class) the findings from the research being done in other DUS classrooms. This was made easier knowing that Sarah-Kate and I were each talking to students in various groups about the

research and our goals for improving my teaching and changing structures to benefit student learning. In addition, we talked to students about ways to become better learners by drawing their attention to their individual learning strategies (e.g., note taking and study habits) as well as their ability to identify and access needed resources (e.g., asking for a tutor, asking for help from the teacher, or getting a calculator) to support their learning. The following vignette from my field notes describes how my sharing research findings with the whole class provided the catalyst for a small, but significant change in my assessment practices.

As my students took a final moment to consult their notes before an exam, I shared what Linda had learned from her research concerning why some students did not complete their exams. As I started to distribute my exam, I asked a group of four girls at the front of the room if they ever left any questions blank on their exam and if so, why. One student said that she just sometimes ran out of time before finishing. I asked her if she could suggest anything that might help. Lindsey pointed out that she could make more informed choices about how to take my exams if she knew the point value assigned to each problem because the point distribution on my exams was not uniform. Lindsey said that she would do the problems that were worth the most points first and then tackle the others if she had time. I told her I had asked one of my MCE chemistry professors to do the same thing for me during an exam. Before the students started their exam, I asked for everyone's attention and I wrote the point values on the board as I relayed the conversation that had occurred between Lindsey and me to the rest of the class (Sonya, Field Notes, January, 2002).

Following this conversation with Lindsey, I began printing the point value for each problem as well as an explanation about what would be considered a complete answer for each essay question on the exam. While this may be a common technique for more experienced teachers, I had not previously considered the importance of student knowledge concerning point values assigned to the different sections of my exams. (In addition, the practice of developing rubrics for each assessment would be too time-consuming when creating everything from scratch because I was not provided with any supporting teacher materials.) It was not until Lindsey told me that due to time constraints she sometimes had to sacrifice certain problems in order to complete others that it became clear to me that knowing the value assigned to different questions would allow her to make more informed decisions about which problems to skip.

Following this small change in my assessment practices, I noticed that students felt more confident knowing that should they need to sacrifice a problem due to time constraints, they could do so strategically. During this class period, I noticed students searched through their exam, marking problems with the highest point values as top priority so they could work in the most efficient manner they deemed necessary. This change in my assessment practice did not require a major reconfiguration of my schema and was actually a request I had made of my own professors as a student in the Masters of Chemistry Education (MCE) program. As such, this was not a difficult change for me to make. Reading my field notes today, I immediately wonder why I was not more concerned by the fact that students did not feel they had enough time to answer all the questions on my exam – no matter the point value. However, reframing this small piece of my assessment practice as problematic was the most I could consider at that moment.

During this in-class “huddle,” Lindsey and I negotiated a way for her and her peers to increase their involvement in the assessment process while simultaneously increasing student confidence in my willingness to make changes that benefited their learning. In doing so, I gained significant social and symbolic capital with my students. Even though this interaction took place during a whole-class discussion, I was able to make a change in my teaching practice without much risk to my identity as a science teacher. This small exchange paved the way for more significant changes in my assessment practices – all based on student suggestions. In later months, when students asked for partner exams and formula note-cards, I needed more time and discussion with the class before I could implement these changes. Fortunately, cogenerative dialogue provided the structure necessary for my students and me to be able to individually debate these ideas and to implement them collectively. While unsure how some of their suggestions for change (especially increased group work and the implementation of group assessments) would affect their learning of chemistry, I trusted their suggestions for change were based on their vested interest in their own learning. This was based largely on my changing view of my students as a result of the time I spent with them in cogenerative dialogues where the social structures between my students and me were constantly being renegotiated. I did not fear that their suggestions were a scheme to “get over on me”

and “to get out of working,” but rather that their suggestions stemmed from their thoughtful reflections of how to best to “teach kids like me.”

7.2.2 Re-considering the Role of the Student in Co-constructing Change

While this change in my assessment practice may seem like an insignificant matter in many respects, it was an “eye-opening” experience for three reasons: 1) I realized that Lindsay and my students were capable of making important suggestions for change that would support their learning; 2) it made me recognize how little consideration I had put into developing my assessment tools; and 3) I realized how easy and painless the process of change could be if both the teachers and students bought into the idea of making the classroom a better, more supportive place to teach and learn. As Lindsay and her classmates waited for me to share with them “how much each problem was worth,” I was quietly “making it up” while writing the point distribution on the board! I was deeply puzzled that I had not considered this a problem before our in-class huddle. My practice before this encounter was to assign point distributions when making the grading-key, something I generally did after students had already taken the exam. After this experience, I realized how arbitrary this practice had been and how my haphazard assessment practices could disadvantage my students. For the first time, I began to consider *why* I assigned certain problems a certain point value. In addition, I began to think about how this assignment was connected to what I felt was significant for students to learn. I started asking myself if my assessment tools really aligned with the curriculum I presented and the personal goals I held for my students. I found the answer to be “no!” more often than “yes!”

This incident marked a turning point in my thinking about my assessment practices and my involvement of students in the process of deciding what was important to assess about *their* learning and how best to design these assessments. For the first time in my five years of teaching, I began to consider consciously what I wanted students to understand and take away from a lesson and I began to re-evaluate how students should be asked to demonstrate what they had learned. This marked an important development in my thinking about my teaching because for the first time in my career, I began to analyze critically the purpose of my assessment tasks and to question the usefulness of these tasks in light of my expectations for student

learning. This incident was also significant in helping me consider the role of the student in the classroom. Through cogenerative dialogues outside of class and our participation in informal huddles in class, I began to see my students as capable of taking an active role in the classroom and in their learning. Through their experiences as researchers and their participation in cogenerative dialogues, students were becoming more practiced in analyzing classroom interactions and in voicing their ideas and opinions in a responsible, constructive manner. By listening to student ideas and incorporating their suggestions into the classroom, I demonstrated that I valued their contributions – enabling us both to see them as agents of change. As a result, students became more comfortable questioning me about my practices, asking for assistance, and making suggestions for changing the class. On the other hand, as I continued to re-evaluate my goals for their learning, I became cognizant of the fact that much of my teaching praxis resulted from my *habitus* (shaped by past historical and cultural experiences). The realization that many of my practices were the result of an experiential reflex, meaning I was reacting *to* situations more than planning *for* situations, made it easier for me to reflect on my practices with my students and to listen to their suggestions for change. Recognition by my students and me that many of their practices also stemmed from reflex allowed us all a greater freedom to analyze, discuss, and reflect upon our classroom practices without internalizing negative feelings with regards to these practices. In this way, cogenerative dialogue provided a pathway for us to critically co-reflect on and share our beliefs, goals, and feelings concerning teaching and learning in order to afford changes to structures and practices that enabled us to collectively teach and learn chemistry.

7.3 WHEN SOCIAL CHANGE LEADS TO STRUCTURAL CHANGE

By the end of the second marking period, my students and I were becoming deeply invested in our quest to make change because we were beginning to see the fruits of our efforts. While change was slow to start, by the end of the third marking period, we had gained a great deal of momentum, supported by new social structures formed during cogenerative dialogues, which enabled us to implement changes at a faster rate. In the following sections, I briefly highlight some of the more radical changes that occurred in our classroom in terms of assessment during this time period. It seemed the more my students and I learned about one another, the more possibilities

we saw for change and the easier it was for us to share our understandings and suggestions with one another “in the moment” as in the previous vignette with Lindsay. These changes started to avalanche as my students and I became caught up in a fever to “change the way we did things.” The following section provides a sequential outline of the assessment practices my students and I negotiated during the second and third marking periods.

7.3.1 Tailor a Test

The next major shift in my assessment procedures involving tests was directly related to the conversations I had with students in the previous vignette concerning the values I assigned to problems on exams and the resulting student practices of choosing certain problems based on complexity and point value. I pointed out to students that I noticed some were choosing to answer certain questions while choosing to avoid others, no matter the point values assigned. For example, some students concentrated on conceptual problems while others chose quantitative problems that required more mathematical reasoning. Speaking informally to a small group of students before class, Erica offered that she felt more comfortable answering conceptual problems rather than quantitative questions. A second student then asked me was it important for them to learn the concept or the math behind the concept. After thinking for a moment, I told my students I thought it was more important that they develop a better conceptual understanding, but that I also wanted them to be able to represent their understanding mathematically. Jenna pointed out that the exams I created seemed to focus a great deal more on solving quantitative problems than conceptual. We then decided to analyze the last two exams to see if this were true. After looking over the exams, my students and I agreed that my exams did expect students to express their understanding mathematically more often than conceptually. Yri, a new student researcher involved in transcript analysis, added that he felt less comfortable with conceptual problems because he had to spend more time trying to translate the questions from English to Russian (his native language). Yri added that “math was a universal language” and he would then be disadvantaged if I started creating exams that catered to conceptual learners. Hearing Yri’s comments, I decided that it was unfair to both sets of students to concentrate on only conceptual or mathematical understandings. Based on this conversation, I introduced a new exam format that I called “tailor a test.”

To make my exams fair for all students, I created an exam with different sections that exceeded 100 points in total value that allowed students to choose any combination of problems that would equal 100 points without exceeding that value. This option enabled students to choose specific concept-related problems that they felt they were particularly able to answer while minimizing contact with some other problem types. For example, a student could choose to answer a concept-based question about pressure rather than a mathematical question based on the same concept (see Table 7.1). The two problems were equal in value and students were encouraged to choose either one and to show their reasoning for their answer, including setting up the problem and explaining how they would go about solving the problem even if they did not feel they could actually provide a final answer.

Table 7.1 Pressure Exam Question

Choose to answer one of the following questions about pressure. This problem is worth 8 points. Remember the *process* is more important than the answer. Make sure you show all of your work so we can analyze what you need to continue to think about.

1. When we hold school dances in the gym, why won't Coach Parker allow students to walk on the gym floor wearing shoes with small-diameter heels? Why are wide-heeled shoes preferred? Explain the relationship, in terms of pressure, between the area of the heel of the shoe and the force the shoe applies to the floor.
2. Compare the pressure applied by a ballet dancer to the floor when she is in the following dance positions: a) two feet on the ground (contact area = 325 cm^2); b) on her tiptoes (contact area = 13 cm^2); c) on one tiptoe (contact area = 6.5 cm^2). Assume the ballet dancer has a mass of 51kg. (Hint: Remember that at Earth's surface, each kilogram of mass exerts 9.8 N of force due to gravity.)

Students were then encouraged to use the graded exam to analyze the areas they felt they needed more help with before the next exam. This not only reduced stress and anxiety related to test performance, but provided students with a diagnostic tool that could direct their continued studies based on the problems they felt they were unable to answer. Students appreciated both aspects of this assessment tool and as a teacher I was able to take note of the section or sections that many students avoided. This gave me an idea of which concept areas needed to be re-taught in an overall class setting or in the after-school homework sessions. In addition, this format provided insight about which concepts students felt most comfortable with so I knew I could

build on those topics or continue on to new topics knowing that students shared a common understanding in these areas.

7.3.2 Point for Point

As I became more aware of student needs and concerns about exams, I began to notice that although many students seemed competent enough while working on problems in class and in groups, when placed alone with an exam, they often struggled. While this could be attributed to many things, I felt that student anxiety was a major contributing factor. (Test-related anxiety was something I was also very familiar with as a student). In an effort to make students more comfortable while taking their exams, I began to continuously walk around the room and look at student exams while they were working so I could offer encouragement and advice. By walking around, I could monitor how the class as a whole was faring on an exam as well as monitor how individuals were doing. Before our discussions about assessments, I had generally sat at the front of the room while students took exams, monitoring students to make certain no one cheated rather than trying to determine if my students needed help. This change in my practices was not a direct result of any discussions in our cogenerative dialogues; however, it did arise from my heightened sense of awareness about how I could make my students more comfortable and successful while taking exams. When asked to comment on this new practice in cogenerative dialogues after this exam, students requested that I continue to interact with them in this way.

By walking around the room, I made myself a resource for students by asking students to “call me over for any questions at all, even if it is just to clarify a question on the exam.” This practice of walking around the room benefited my students because it allowed them to ask easily and discretely for help without having to disrupt the whole class by walking to the front of the room to ask me a question. Students commented that by making myself physically available, they were more likely to ask for help because it was less embarrassing. This practice was also helpful for me as a teacher because it enabled me to troubleshoot “in the moment” rather than finding out that a majority of students had missed a problem because a question was unclear but students were too embarrassed to ask me for clarification for fear that their peers would think they were struggling during an exam. This eliminated

some of the frustration my students and I experienced in the past because I now had a way to help the whole class before it was too late for us to address and rectify any problems.

While walking around the classroom, I noticed some students were struggling to answer questions that I knew they were capable of answering because I had seen them do so during class while working in small groups. Frustrated that these students were unable to demonstrate their knowledge during the exam, I started asking students to “talk through” problems with me. My experiences in cogenerative dialogues with students helped me recognize that fairness and peer perceptions related to achievement were important issues for students. This made me sensitive to the fact that students might be worried their peers would think that the help they were receiving was unfair and that by approaching students to offer help, I was making their private struggles public. In addition, although my beliefs about the importance of grades and assessment were changing and I felt it was more beneficial that students be able to describe the process of solving problems more than “get the right answer,” I was still uncomfortable with the idea that I was giving students the answers by offering any help during their exam. For these reasons, I told students that I would “give a point (of information) and take a point” from a student’s exam for giving them guidance. I added that I felt it was “more important that students be able to work through a problem than not answer the question at all,” even if that meant me giving students a “gentle prod in the right direction.”

Following this announcement, student hands shot in the air and I found that I was moving all over the room giving small hints and confirming student thinking so they had a jumping off point from which to continue. This process greatly reduced student stress and increased student participation, particularly among low achieving students as I provided yet another resource that helped to mediate their goal of achieving a better grade on their exam and my goal of having students learn chemistry. During this time, I began to place less emphasis on points and grades and really began to focus on student understanding. In some cases, verbal answers replaced mathematical explanations on exams, again increasing student participation, student interest, and, above all, student learning. In these instances, I simply made a check mark next to the problem noting that a student had “answered” that problem orally in

class. This change in how I administered exams was very significant. It was during this time that I believe I made a definitive change in my schema regarding the purpose of exams. The process of thinking and communicating understanding became more important to me than whether or not students could provide the “right answer.” In my previous two years of teaching chemistry, I rarely gave students partial credit for their answers, requiring the correct answer to be placed in “the box” for any credit to be given at all. When asked to comment on any of my teaching practices that students felt most benefited their learning in chemistry, Sara offered the following in her end of the year reflections:

To me, tests and quizzes are not adequate means of assessment. This is because many people are just not good at taking tests, such as myself. Often I would study too hard and make myself too nervous that when the test was laid in front of me, my mind went blank. For this reason, I will miss your partial credit grading! Without your at times lenient grading technique and point distribution, I would have done much worse on tests and on my report cards (End of the year survey, July, 2002).

Seeing how this small change in my practices enabled a student like Sara (introduced in chapter 5), who had developed a very negative association with science, to re-engage in her learning and to maintain focus without being overwhelmed by her sense of frustration and hopelessness to “do well on a chemistry exam” inspired me to find more ways to support her and students like her. This experience encouraged me to look past grades in an effort to improve student learning. Yanque describes the impact of these assessment changes on her and her peers in the following journal entry in which she was asked to reflect on the issue of fairness in our classroom.

I think that Ms. Martin is a fair person. She wants us to do good. Like on tests, she'll try and spread out the points on questions so we can still get credit on a question without getting it completely right. But it's more than that. Like it sometimes seems like she goes out of her way to have us do good. It's a nice feeling. For example one of my friends didn't do well on a test and when she pointed out [to Ms. Martin] a question on the test where she thought she could have received some points, Ms. Martin was thrilled to check it over and give her more points! (April 2002, Electronic Journal entry).

These experiences enabled my students and me to re-conceptualize what it means to assess learning that led to even more discussions and change with regards to assessment. In addition, the positive emotional energy that was generated by this

change in my practices contributed to increased solidarity among my students and me as we struggled to learn about chemistry (and one another).

7.3.3 Partner Exams

The final phase of the evolution in my use of exams as assessment tools grew from a discussion I had with a group of students in class who questioned the “fairness” of individual assessments when our class was largely organized around group learning activities. After asking for suggestions, one student asked that I consider administering a partner exam as the culminating assessment on a unit on pressure because the whole unit had been taught without any individualized student work. I was not sure what a partner exam would look like in practice, but because many students were visibly anxious about the particular difficulty of these chemistry concepts and because I agreed that assessing them as individuals after relying so heavily on group work seemed unfair, I decided to give it a try.

Following a discussion about the importance of shared responsibility for test taking and individual student learning, I allowed students to take the exam in groups of two. I was nervous about taking such a large leap towards what seemed like a radical activity, mostly because I was uncertain how this partner test would accurately reflect the knowledge of one student. As I circulated around the room, I was amazed to hear the conversations students were having as they answered the questions. They were making assertions, drawing diagrams, gesturing to explain concepts, and arguing when they disagreed. These interactions were, I decided, more important than the final solutions written on the paper and more valuable in terms of science learning and understanding. My students and I agreed that answering questions cooperatively contributed to a new level of understanding because students not only needed to “know” something, but they also needed to be able to communicate accurately that knowledge to others. When asked to reflect on the usefulness of partner exams, Jaydon shared the following in his end of the year student reflections.

It [working in groups] gives me time to ask lots of questions and work out a problem as my group is helping teaching me. Also I got to teach them. You know you truly understand something when you can explain it to someone else (July, 2002).

I found that this interactive, community-based discussion of science concepts provided a more comprehensive representation of what students had learned than any

other form of assessment I had previously used. This reinforced my new schema focusing on how to “get at student understanding” using whatever means necessary. In addition, I began to reformulate how I calculated student grades – taking into account the importance of student discussions, group work, and student questioning practices as part of their grade. I devised new grading schemes and rubrics that de-emphasized individual student assessment and focused more on group contributions to teaching and learning. In the following reflection, Jaydon shares his vision for student assessment.

I think just watching a student in class and how they interact and learn is a very fair assessment. Also maybe have a student teach the class for a day or do something different like that. I think there should just be more emphasis on students proving they know things by what they do in class (June, 2002).

Comments from low-achieving students like Sara and Jaydon were providing a driving force for change in my classroom assessment practices. During the third marking period, all 26 students in the class made a final grade of B or higher. And, just as I had noticed in the second marking period, students who had performed poorly during the first marking period and who were chronic low-achievers in past science classes³³ were all improving. However, I was puzzled by a new emerging pattern. Students who had previously made high A's during the first term and who were high-achievers in their past science classes, were without exception scoring lower in the third term³⁴. At Urban Magnet, when there is a decrease in achievement among the “top of the class” even while “regular kids” are improving, it causes concern for parents, students, and teachers alike. In retrospect, it was clear that not all students shared the view of Jaydon and students like Jaydon who were uniformly benefiting from these changes in assessment practices. Once again, it seemed that making structural changes had resulted in increased agency on the part of some members of the classroom at the expense of some others.

³³ As an advisor, I have access to all student report cards and was able to compare student grades in science (and math) from grades 5 - 9. I categorized students who made low B's or less as low-achieving in comparison to their peers who made high B's or all A's.

³⁴ Analysis of student grades in their other courses shows they maintained their high grades in all their other courses. Only in chemistry class did they see a decrease in their grades.

7.4 LOSING EQUILIBRIUM - DIFFERENT SIDES OF THE SAME EQUATION

As change became a mantra for student involvement in the classroom, it became more difficult to see both sides of the teaching and learning equation. A driving force for this research was to provide students (especially those who were historically disadvantaged by school structures) with a greater voice in the classroom in an effort to improve their relationship with science, their peers, and me. To examine the extent to which this was a reality, the remainder of this chapter is dedicated to sharing the stories of Jaydon and Mark. By sharing their individual experiences through the voices of multiple participants from a variety of data resources, I demonstrate the ways in which co-generated structural changes shaped the agency of both Mark and Jaydon in very different ways. In the following two sections, I present Mark and Jaydon's experiences with their peers and with me over the course of the year as we engaged in cogenerative dialogues to address and resolve contradictions that arose due to these changes.

7.4.1 (Re)Structuring For Student Achievement

During one of our first cogenerative dialogues, Sarah-Kate asked me to characterize the students in my class both individually and collectively. In doing so, I told her a lot about the culture of our school, the high expectations for student achievement, and that our students were generally well behaved and able to meet or exceed the expectations set by the school, the teachers, and their parents. When I started to describe students individually, however, I noticed that my descriptions differed greatly from my earlier statement. Through cogenerative dialogues with multiple participants over the course of this research, the issue concerning the influence of capital (social, cultural, symbolic, and economic) on student agency and achievement in the classroom became salient. This was particularly true for students of color, and/or low socioeconomic status, and/or for students whose learning styles differed greatly from what was valued in more traditional science classrooms. During this research, cogenerative dialogues provided my students and me with opportunities to co-construct new classroom structures that supported the learning of students who were often marginalized in science classrooms. The following section describes Jaydon's experiences as a participant in this research and the ways in which our co-constructed structural changes shaped his agency in the classroom.

7.4.2 “You Ain’t Feelin Me!” Student Identity and Achievement

Two years after first being asked to participate in this research, five students from my class (who were now seniors), led a panel discussion and presentation (using video clips from our classroom and their personal video ethnographies) at a national education conference. The focus of the discussion was the importance of student-teacher interactions in structuring a learning environment that fostered achievement as defined by students with differing goals for their own science education. The following is a narrative I wrote to introduce one of the students who served as a co-presenter with me at this conference.

*When I was 4 years old, they tried [sic] to test my iq [sic],
They showed me a picture of 3 oranges and a pear
They asked me which one is different and does not belong,
They taught me different is wrong.*

Ani Difranco, lyrics from My IQ (1993)

I can distinctly recall the dread I felt when I first saw Jaydon’s name on my roll sheet. I had covered his eighth grade science class the year before when his teacher was absent and I remembered Jaydon was different from every other child in the class. He was difficult to manage, behaved inappropriately, and talked loudly across the room even while others had finally started to settle down. Other teachers commiserated, looking at my roll sheet and wondering how he had “made it” into the school. Jaydon was certainly different from most of the students at Urban Magnet. Students who did not fit the mould of “model student” at Urban Magnet were often ridiculed by teachers, administrators, students, and parents – constantly reminded of the stain they represented to the fabric of the school. However, as my role expanded from science teacher to include class advisor, sponsor for student government, gay-straight alliance, and the Asian Teen Union, I had an opportunity to get to know my students in a different context, one that allowed me to reconsider what it meant to belong or succeed at Urban Magnet. I began to recognize that the ways in which students were invited to participate in school and to interact with their teachers and peers was an important contributing factor in student achievement. Jaydon’s resistance to participating in classroom activities that did not speak to his strengths and interests said more about the inability of his teachers to adapt to his needs than it said about his ability to achieve. As I learned more about my students’ experiences [through cogenerative dialogue] at Urban Magnet, I started to question what about being *different* was *wrong*? (Ethnography Presentation Notes, February 2004).

Six weeks into the first semester, Jaydon was failing Chemistry with a low F. And while Jaydon had never been a student in one of my science classes, we had

developed a pleasant relationship during our first year in advisory³⁵. As his academic advisor and as Mrs. Costa's colleague, I knew Jaydon had barely passed Biology the year before and that he had developed a problematic relationship with Mrs. Costa (and science). Over the last year, I had grown not only to like Jaydon, but to admire and respect his sense of civic duty and community activism. I found him to be articulate, impassioned, and focused on his goals. Unfortunately, none of these attributes seemed to be helping him learn chemistry. Recognizing Jaydon as a student whose differences (political and social beliefs) positioned him as Other in relation to many of his peers and most of his teachers, I strongly identified with his struggle to maintain his independent sense of self in an environment that promoted conformity to the "norm." Feeling I could help Jaydon become more successful in the classroom without asking him to sacrifice his individuality, I reached out to him.

7.4.3 Walkin' the Walk

Reaching out to students and their parents to discuss ways of improving student performance in my classroom was a common practice for me before this research. When I invited Jaydon and his mother to meet with me, I had only been involved in the research for six weeks. However, my participation in the weekly Discovering Urban Science (DUS) meetings made a considerable impact on the outcome of this discussion because I felt I had a real plan for effecting change. In my DUS meetings, I was being introduced to learning theories that prompted me to consider the role of conflicting goals or aims between students and teachers and how these conflicting roles affect learning in the classroom. This provided me with an important tool to help me re-conceptualize Jaydon's struggles as a conflict between our goals rather than his inability to learn and my inability to teach him. In revealing our differing goals and expectations for participation and achievement, I hoped Jaydon and I could propose possibilities for resolving these conflicting goals. I wanted to find a way to better support Jaydon by aligning his natural talents and interests with learning chemistry.

³⁵ Advisory is a daily class period in which attendance is taken and school announcements are made. In addition, class advisories spend one 50-minute guidance period together each week. During this time, my students and I had opportunities to talk about social issues, work on school projects (such as recycling, can drives, etc.), and to complete necessary state- and city-standardized exams. Advisory is explained in greater detail in chapter 4.

Before this research, I had met with parents and students on numerous occasions in an effort to “help students improve” in my classroom. During these meetings, students would typically sit quietly at the table while their parents and I suggested methods by which their child could “improve their grade.” Possibilities for improving their grades included tutoring, studying more, decreasing participation in extra curricular activities, and so on. Rarely were students involved in suggesting strategies they felt would benefit them and never once was a student asked how he or she felt about being a student in my classroom, how he or she felt about science, or about his or her interests or goals for their own learning in my class. That was all about to change as I embarked on my first cogenerative dialogue with Jaydon and his mother³⁶.

7.4.4 Chemistry in my Life?

In order to better support Jaydon in my classroom, I knew I needed to learn more about his personal goals for his life, school, and science. Jaydon started by telling me about the various organizations he belonged to outside of school. He was volunteering at three different places, played baseball in a neighborhood league, was an active member of the Philadelphia Student Union advocacy group, and he was a leading member of several clubs in the school that focused on student rights. Clearly Jaydon was a very motivated and hard-working person – but where did academics and science fit into his life goals? While recording his video ethnography, Jaydon addressed the issue of how chemistry was relevant to his personal life goals. The following video image (see Figure 7.1) and transcript are taken from a portion of Jaydon’s video ethnography that he submitted in May 2002. I include this video image of Jaydon because it is striking that he has set up his camera to record himself speaking in a monologue fashion; this method of recording “science in my life” differed from many of Jaydon’s peers who tended to focus on the world around them (recording images of their families, interviews of their peers, and where they “saw science” in the everyday).

³⁶ It is important to note that at this time in the year, I would not have characterized this meeting as an official “cogenerative dialogue.” As stated in previous chapters, the use of cogenerative dialogues emerged as a critical site for change as the school year progressed and as we have analyzed and reflected on these discussions over the last two years. This discussion was not introduced as a cogenerative dialogue to Jaydon and his mother however, in retrospect it would be characterized as a cogenerative dialogue.

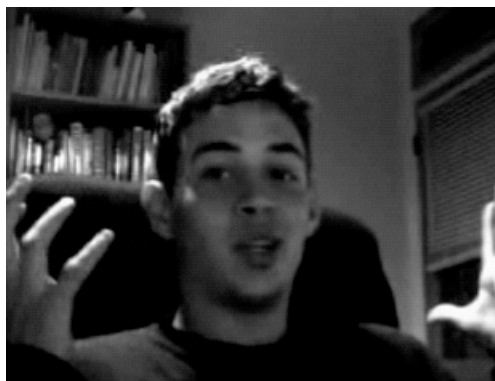


Figure 7. 1 Jaydon speaks to the camera about the role of science in his life.

Jaydon: I was thinking of, uhm, what's the first thing, like when you say chemistry, what is the first thing that comes to my mind? And the first thing that comes to my mind is class, second thing is Ms. Martin, third thing is tests, homework, things like that. When I say like World History, like English, something like that this is not the first thing that comes to my mind. It's like poetry and, you know, different things, like history that stick out in my mind. And I don't know why that is, I just think that is very interesting. But chemistry, it is just a class for me. I think it is because everyone I look up to, when I ask, 'do you ever use chemistry in your life?' and they're like, 'No. Never. I've never used chemistry.' I have three jobs now and all three of them are stuff I do for free and it is stuff that I love doing and I have fun doing and, I never use chemistry in doing any of it.

Although taken from his ethnography produced at the end of the school year, this transcript closely mirrors the conversation I had with Jaydon and his mother at the beginning of the school year. During our cogenerative dialogue, Jaydon stated that he wanted to make “decent grades” in all of his classes, but he admitted he was not overly concerned with grades and that he had no goal of “making an A” in chemistry. Jaydon described chemistry as “the lowest priority in my life.” This was a sobering statement.

Before my involvement in this research, I can imagine this comment would have signaled the end of this conversation for me because my two bargaining chips, student interest and grade motivation, were lost to me. Jaydon stated he was not motivated by grades nor did he seem to have an interest in science. Fortunately, I was armed with new strategies that encouraged me to continue this dialogue in an effort to offer Jaydon and his mother options that might prevent Jaydon from shutting down in class. As such, we continued our conversation, exploring Jaydon and his mothers' goals for his life and our collective goals for his participation in chemistry class. In an effort to connect with Jaydon, I related a personal story that I felt paralleled his struggle in my class – my own battle with learning a foreign

language in college. Frustrated that my program had a foreign language requirement, I did poorly during my first year of French because I was not at all interested in the subject and I did not see the relevance of learning a foreign language to my life as a scientist. Unable to continue with French due to my poor grades, I had to start two years of a second language – Spanish. My goal for the course was simple: “pass without any heroic measures.” Even though the course and the grade did not count towards my science major, it was still difficult to convince my professor that this was the best plan for me. After some discussion, we eventually negotiated terms that we were both comfortable with. Using this introduction, I asked Jaydon and his mother if they would help me develop a plan of action that satisfied our differing goals for the term. In this way, we set out to co-generate a solution to our individual problems that we could collectively implement and support.

Jaydon’s mother was concerned about his overall average for the year because she was concerned that a low GPA (Grade Point Average) would prevent Jaydon’s chances to “get accepted to a good college.” Jaydon himself stated he wanted to get a “decent grade” and I felt that he could certainly do better than the F/D he currently had. Together, we agreed that a minimum of a C would be acceptable, with a goal of a low B. After setting a goal for his grade (an issue of great importance at Urban Magnet), we started to talk about personal goals for the course. My goals for Jaydon were for him to increase his participation in group activities, to attend after-school tutoring sessions when needed, and to develop a better appreciation for science. Jaydon also set personal goals for himself to make his participation in class more fulfilling. In the following transcript from Jaydon’s video ethnography, he reflects upon these goals and the plan we collectively negotiated to make his participation in chemistry not “feel like a waste of his time and energy.”

Jaydon: People I look up to and the stuff I do in my life are never, ever affected by chemistry. It is so hard for me to even comprehend how I am going to put this into my life and how I am going to use it and how I am going to utilize these tools. I try to get something out of everything I do and it is really tough for me to put this into the big picture, in the big scheme of things. And the only thing I can get out of this is doing something I don't particularly enjoy doing and uh, just working hard at something I am not at all good at...and that's that. That's what I'm trying to bring from this class. I'm not trying to learn about molecular formulas. I'm not trying to learn about Boyle's Law. Like I guarantee, I hate to say it, but I'll probably forget it at the end of this year. I'm just trying to, you know, learn how to work with people better and do things that I'm not good at. And that should take me places.... Ms. Martin had a conversation and I think both of us understand that this [chemistry knowledge] isn't something I'm ever going to use, but I understand that it is something I have to get done. I never use that as an excuse. I know I just think you guys are doing this study on why kids learn chemistry the way they do and ... well if something interests me like English. I love English class. I love what we're learning (*pats hand over heart*). I love what we're doing, and I put an honest effort into that to actually to learn it (*pats hand on head*) to like remember it, to get something out of it. But I can honestly say in Chemistry class. Like I do in math class, like I do in computer class, like I do in French class (*laughing*) – that says something about school... that I'm just trying to do it to get by and to pass the next test. You know, to take things out of it outside of the actual (*uses fingers to make quotation marks*) curriculum structure. I am just trying to get stuff out of it as far as me growing as a student (Jaydon, Video ethnography, May 2002).

I have had many opportunities to share Jaydon's video vignette with various high school science teachers and science educators and I am always struck by their initial responses. Widely acknowledging the fact that they too face the problem of helping students like Jaydon see the relevance of science to their lives, they are generally critical of Jaydon, his mother, and me for "encouraging" him to honestly express his negative views about the relevance of learning science. One teacher commented we were "enabling" his negative view of science. In reflecting on these experiences, I believe that many teachers react so strongly to this vignette because it is scary to imagine having this discussion with a classroom of Jaydon's who find it difficult to "even comprehend how science affects their lives." Before my participation in this research and in cogenerative dialogues, I too would have doubted the value of engaging students in conversations such as this. However, I believe these conversations were important resources for my own ideological shifts about what "science for all" really means. In addition, inviting Jaydon to express his beliefs about science and to set his own goals for learning, his mother and I demonstrated our willingness to allow him greater responsibility for his own learning and "growth as a student." The more I engaged in conversations with my students about the purpose of school and science, the more I was able to accept that while I need to

make science accessible “to all,” science for all does not mean everyone is destined to become a “scientist.” Even in a school where grades are very important, making an “A” in chemistry is hardly a noble motivation for learning chemistry. Restructuring class to allow multiple goals to be met at once, my students and I found “science for all” could look different for everyone. For some students, like Jaydon, learning to work hard to learn something you do not necessarily enjoy (like science or foreign language) was important. For other students, getting an “A” and doing well on the SAT II in Chemistry was a priority. In either instance, I felt it was my responsibility to help students realize their goals by providing a classroom structure that encouraged and supported the learning of the individual and the collective. However, this proved to be difficult because changes in structure can afford agency for one group of students while simultaneously truncating the agency of another group. Our classroom was no exception.

7.4.5 When Changing the Base Destabilizes the Top

At the same time Jaydon was struggling to achieve a balance between meeting his goals outside of class and our collective goals within class, a second student, Mark, was excelling in my class, earning the highest grade in chemistry and the highest GPA in the entire sophomore class. Because my main goal for participating in this research was to make structural changes in the classroom to afford agency for students who were traditionally marginalized in science classrooms, I anticipated that altering class structures would benefit students like Jaydon and Chandra, but I did not anticipate how it would affect students like Mark and Yanque. Although Sarah-Kate and I were cognizant that altering classroom structures and teaching practices that prevented some students from performing well would necessarily introduce contradictions for high-achieving students, we did not anticipate the extent to which these structural changes would impact students who had previously excelled in the same “traditional” classes in which their peers had failed.

The structural changes we implemented to afford greater agency to low-achieving students, such as the increased use of peer groups and changing assessment and questioning practices, presented contradictions for several high-achieving students in the classroom that needed to be resolved. Specifically, my concern for Mark grew to the point where Sarah-Kate and I felt we needed to address the issue in cogenerative

dialogues with Mark and his peers. Eventually, I felt I needed to invite his father in to discuss the changes I was noticing in the classroom. The conversations I had with Mark, his father, and his peers had less to do with his progress in chemistry (although Mark's grades did falter), and more to do with the ways in which he and his peers interacted with one another. By changing the structure of the classroom, we also altered the social dynamics. This had far-reaching implications for peer interactions both in our classroom and in fields outside of the classroom. In the following section, I introduce Mark using his own words to describe his social and historical relationships with school, his peers, and science. In doing so, I set the stage for examining how my participation in multiple overlapping fields of cogenerative dialogue in which I was privy to the multiple perspectives of different participants enabled me and my students to suggest, implement, and reflect upon changes that shaped classroom experiences for everyone.

7.4.6 *The "Go-To" Guy*

As mentioned in the previous section, five students from my chemistry class volunteered to participate in a student-led panel focusing on student achievement in relation to student-teacher interactions. In preparation for their presentations, each student prepared a short narrative to introduce them selves to the audience. In this narrative, students were asked to characterize how they identified themselves as students and how they thought others (including their teachers and peers) characterized them. The following passage is taken from Mark's introduction.

The name Mark Jones has become synonymous with everything that a teacher should want, and frequently other students don't like too much. In many classes I've noticed myself as one of the go-to guys, that can be relied on to answer a question at practically any time. I accept this role, but I feel it's more placed upon me than one I gave myself. I'd imagine that typically teachers love me and students are at best slightly frustrated with me. I know that after a while you just get sick and tired of some people talking. Mark is the goody-two-shoes who always does what the teacher wants. Basically, [I am] that one kid that would ask for extra homework or to have a test sooner rather than later. While I understand these boxes I'm placed in, some of them I think aren't very accurate (February, 2004).

Written during the second semester of his senior year, Mark describes himself as the "go-to" guy. He characterizes himself as the type of student teachers call on when they are looking for a particular answer or when no other student volunteers; a

student who a teacher counts on to keep the momentum and pace of a lesson moving forward. Essentially, Mark characterizes himself as a “target student.” In their research in Australian high school science classes, Ken Tobin and Jim Gallagher (1987) described target students as students who tended to monopolize whole-class interactions by responding to teacher questions, asking questions, and providing information. In the same study, they found that teachers were not only aware of these target students (sometimes called teachers’ pets), but that they often purposely called on them to answer more difficult questions to keep the class moving at a particular pace (Tobin, 1988). In cogenerative dialogue with Mark and his father, we discussed my tendency to call on him to answer difficult questions or when I was “looking for the right answer” and how these practices unintentionally and unconsciously set him apart from his peers in a negative way. Mark’s thoughtful reflection upon the role he plays as a participant in the learning environment is evident from his narrative, but before his participation in cogenerative dialogues, Mark admits he “had not given it much thought.” Unfortunately, neither had I.

Tobin and Gallagher (1987) found, just as Mark alludes to in his narrative, that while teachers may be appreciative of target student practices in the classroom, their peers rarely are. As my students and I engaged more frequently in cogenerative dialogues about our chemistry class, this became all too apparent. Encouraged to voice their opinions surrounding student-teacher interaction patterns (including my questioning practices) and the use and structure of peer groups, tension regarding Mark’s target student practices in both whole-class and small-group activities bubbled to the surface. As Mark began to encounter growing hostility from his peers in class, Jaydon (a student who was universally recognized by himself, his teachers, and his peers as “not being good in science”) found himself enjoying greater success within the science classroom. The following two vignettes provide examples of how Mark and Jaydon were both experiencing class and being experienced by their classmates as we continued to alter some classroom structures while maintaining others.

7.5 STEPPING TO THE HEAD OF THE CLASS

As my students and I continued to participate in multiple overlapping cogenerative dialogues, my belief that peers were an excellent resource for student learning continued to develop. Walking around the classroom as students worked in pairs of

two and four, I was often torn because even though students were learning as they never had before, my classroom also looked like it never had before. Accustomed to praise from other teachers, administrators, and parents for running an efficient, orderly, and quiet classroom, I was often concerned by the increased noise level and student movement as students sought out the help of peers from across the room and at times, in other classrooms! This was particularly true of Jaydon who found it practically impossible to sit still. I tried not to place too many limits on student movement in the classroom and generally felt that students were simply “doing what they needed to do when they needed to do it.” However, I was concerned that Jaydon’s practices might have been preventing him from contributing to his peer group and that if these issues were not addressed, his peers might develop a negative attitude when asked to work with him. Sarah-Kate and I decided to watch Jaydon and his group closely during class and to use cogenerative dialogues to discuss what “class should look like” and what “learning looks like.” In the following cogenerative dialogue, Sarah-Kate and five student researchers are viewing a tape of class when Sarah-Kate raises the issue of Jaydon’s constant movement around the class.

- Sarah-Kate: Jaydon, in every video I watch, when you are working in groups, he is all over the room. What is that? What does he do?
- Chandra: Nothing (*laughing*).
- Stacey: =Yeah, he is all over the place (*motions circular motion with hand*).
- Erica: Nah, you’d be surprised. He may look like he’s sitting here like, duh, but actually, he has like really good insights and stuff. And he, like in my group, he did help me understand some concepts that I wasn’t thinking about cause he had the right mind-set.
- Angel: I think the whole moving around thing is just he can’t sit still, he’s gotta be movin’. Can’t sit still.
- Chandra: Yeah, but he be working.

As Sarah-Kate and I analyzed this transcript the next day, we decided that Jaydon’s disposition for movement (tapping his pencil, beating rhythms on the table, standing, walking to other tables to ask other students their opinions, etc.) was not distracting his peers as much as it distracted us. In addition, we learned that these practices did not prevent his peers from seeing him as a serious student, as a resource for their learning, and as a valuable contributor to class discussions. In fact, this conversation not only allowed me to see Jaydon in a new light, it enabled him to gain symbolic capital with Chandra (who was not generally in his peer group in class) as someone who is seen as being “good in science” by his peers, Erica and Angel. Recognizing

that Jaydon's peers found him to be a resource for their learning, I became more tolerant of his need for movement. Student feedback in cogenerative dialogues and video and audio analysis of Jaydon's peer groups indicated that while Jaydon's participation did not resemble what was traditionally recognized as acceptable classroom behavior (moving, laughing, talking loudly, etc.), there was evidence that he was seriously engaged in learning chemistry – he just did not look serious while doing it.

This conversation encouraged me to re-tool my schema once again as I began to reconsider how learning could look in a classroom that encourages students to learn in ways that best suit their individual needs. The following audio transcript of a cogenerative dialogue between Sarah-Kate and me demonstrates how these overlapping fields of cogenerative dialogues shaped my views concerning the importance of group work in supporting students like Jaydon and his peers Erica and Angel. Sarah-Kate and I were discussing whether it would be useful to rearrange student peer groups so they had more opportunities to work with a variety of students in the classroom.

- Sarah-Kate: This group [Jaydon, Erica, and Angel] works well together.
 Sonya: I know. I love them. I am worried about separating them.
 Sarah-Kate: Can you keep them together at all? (2.0) Because Jaydon needs to be able to vocalize stuff for them and he needs to be able to do the same for himself and they seem to understand him best.
 Sonya: You're right. I will look at all the groups and see what we can do.

Although Sarah-Kate and I felt that changing groups would benefit some students in class, we decided to maintain this group because Jaydon and his peers were well suited for one another. I was learning to appreciate the things that made Jaydon and his partners different from their peers. As I focused less on what Jaydon was *doing* differently from everyone else, I was better able to focus on what he was thinking and saying. Over time, he began to participate more and more in whole-class and small-group activities. Trusting that I valued his contributions, Jaydon began to take more risks in whole-class interactions, venturing out of his peer group to ask for help and to share his ideas with others. Video analysis of Jaydon in October and November shows that he often sat at a table without any other students. In addition, in three instances during a class in mid-October I approached Jaydon to see if he needed assistance and all three times he sent me away even while I could tell by his

blank paper that he was unable to answer any of the assigned questions. The following vignette is taken from a class in late January after Jaydon, his peers, and I had participated in a variety of cogenerative dialogues and research meetings with Sarah-Kate and one another. The following occurs 3 minutes into a 12-minute lecture in which students are asking questions about the shapes of electron orbitals.

Jaydon: Okay, um so this could be something that just doesn't need *(trails off while pointing at the board)* I just need to know, is the shape the way the electron moves?



Sonya: That's what we think of it as. In its orbital, if it's P, then we think of it as being confined somewhat to a shape like this. A space like this *(retraces dumbbell shape on board)*.

Jaydon: Okay. It's moving in that shape as it goes around?

Sonya: Well, but it's in that space *(pointing to the dumbbell shape)* everywhere at once is the idea. Just like when we were talking about the fingers *(shakes five fingers back and forth in front of face)*. It just, it's moving so quickly it's everywhere at once.



Jaydon: Right, right, right, right, right. But okay. Can I get up and *(motions towards the board)*?....

Sonya: Sure. Yeah, go ahead *(Sonya hands Jaydon the chalk)*.



Jaydon: Like, like is it all right (*points to drawing with chalk*) so it's all in here? Is it like all moving in here around?... It's constantly in there, and this like, you know what I mean? Like this shape here is like electrons constantly in this shape. Is this shape moving around in it?



Sonya: Um, the shape moving around? (*Sonya now takes the chalk and attempts to clarify what Jaydon has asked*). In relationship to the nucleus no. The nucleus, my understanding, is that the nucleus would be in some node in the middle and that these shapes are all around it.



Jaydon: Oh, oh, yeah. Okay, right. (*Jaydon returns to his seat as Sonya turns to the class to address the whole class as she explores Jaydon's question*).

Sonya: The nucleus, my understanding is that the nucleus would be in some node in the middle, and that these shapes are all around it. So the one closest to the nucleus would be the 1s, which is the general sphere. And then you have a 2s which would be another sphere. And then you would have all these additional P's, but I've never seen a drawing that looks like that [representing the p orbitals], but that's my understanding of how it works.



This vignette depicts a classroom in which students are encouraged to ask questions to meet their individual needs as learners. In a classroom where he was encouraged to ask questions, offer explanations, and participate in ways that made sense to him, Jaydon began to gain social and symbolic capital with his peers and with me as someone who knew science. These positive experiences over time enabled Jaydon, his peers, and me to see him as a resource for the learning of others. The positive emotional energy Jaydon felt while working with his peers and interacting with me allowed him, for the first time in his school career, to begin to build a positive association with science. Although I was unable to recognize this as problematic at

the time, it became increasingly clear as the semester continued that students were more willing to let Jaydon take the spotlight than a student like Mark. This contradiction became a point of great contention in the classroom as students like Jaydon began to challenge the “smart kids” in ways that were not structurally possible before. The “smart kids” were no longer seen as the only authority in science, they were no longer making the highest grades, and their voices were being drowned out as their peers began to step to the head of the class. What was clear to me at this time was the transformation taking place in my classroom in which students who were previously intimidated by their lack of science knowledge, self-conscious of their mistakes, and reluctant to take risks in their learning were now thriving.

The above vignette is representative of the type of transformation that was occurring in our classroom. It provides a striking contrast to the vignette introduced in chapter 5 in which I provided a snapshot of my classroom before my participation in this research and cogenerative dialogues. The earlier vignette shows a classroom structured to privilege the voice of the teacher, where student-teacher interactions are organized and controlled, and where students know to raise their hands to ask questions, etc. However, the quality of this student-teacher interaction between Jaydon and me is very different. This vignette reveals a classroom in which I was able to share the node of the chalkboard (a space traditionally reserved for the teacher) with a student. In addition, I was able to entertain a student question for which I had no definitive answer and was readily able to admit the limits of my knowledge. This was part of a conscious change in my practices in which I encouraged my students to question me and to even correct me when I made a mistake. Video analysis of classes during this marking period (mid-January to early-April) reveal a changing pattern in my teaching practices in which I increasingly invited students to come to the board to correct my mistakes, share different methods of solving problems, and teach assigned sections of the text to their peers.

However, even this coherence was met with contradiction. The following vignette is taken from my field notes in which I describe an interaction between Mark and me that represents a contradiction to my changing practices.

While in class today, I made several mistakes in a problem set involving a series of mathematical conversions. After Mark had pointed out two conversion mistakes and a misspelling on the board – I blew him off, asking him to “lay off and to stop picking (on me) so much.” Mark, of course, is generally applauded for finding my mistakes and helping me – so he grew very quiet for the rest of the class. I felt awful. I stopped him after class and I apologized. I told him it was the anniversary of my mother’s death and that I was a little frustrated and distracted. I ended by saying that he generally does not bother me when pointing out mistakes and that I rely on him to do so. It was nothing personal. He said had he known, he would not have said anything. We shook hands and parted (Field notes, March 13, 2002).

This exchange was particularly disheartening to me because I wanted my students to feel that they equally contribute to our discussions and the learning of chemistry. In light of what I was learning in cogenerative dialogues concerning how some students felt about Mark in class, I recognize now that this exchange may have contributed to their growing frustration. However, because I had gained a certain amount of social capital with both Mark and his peers, I was able to offer my explanation and apology. In previous years, even when I recognized I was in the wrong, I was reluctant to admit my fault or apologize to my class for fear that I would lose control of the classroom and open myself to a barrage of unwanted criticism. Thankfully, the relationship I was developing with my students through our participation in this research and in cogenerative dialogues presented me with a wider range of options for addressing conflict and for resolving contradictions.

7.5.1 Socializing for Change

Microanalysis of video from classes filmed during the same marking period reveals other significant changes in my teaching practices, especially involving student and teacher questioning and answering practices. In one 10-minute period from a tape recorded on February 6th, eight different students asked 15 questions in rapid succession. Analysis of five classes from this marking period demonstrate another pattern in which students started to ask questions directed more towards the whole class than towards me. Often times student questions were answered by other students and on a few occasions, students were not even facing in my direction when they posed their questions; instead they directly addressed their peers. This indicates that students were beginning to see one another as a resource for their learning and no longer viewed me as the only “holder of knowledge.”

Reinforced by student comments in cogenerative dialogues that peer groups greatly enhanced their understanding and benefited the learning environment, video analysis of all 16 classes recorded during this same marking period demonstrates that I relied more and more on group work for whole-class instruction rather than lecture. Compared to tapes of classes from the first semester and in early January, I spent less and less time lecturing in each successive class, eventually averaging less than 10 minutes per period. The time students spent working in groups increased proportionally as time spent in lecture decreased. In some instances, students were engaged in self-directed investigations with little or no input from Sarah-Kate or me during the entire class period. Spending less time lecturing at the front of the board provided me with more time to work with individual students in small groups. In doing so, I increased the direct contact time I spent with each student in my class. Analysis of one 50-minute class period on March 5th provides a nice example of this. After presenting new information in a mini-lecture for approximately 7 minutes, I asked students to break into peer groups to work on some problems (both conceptual and quantitative) from which students were learning to deduce chemical formulas from the oxidation states of elements that they found by using their periodic tables. In the 11 minutes that followed, I visited each of the eight student groups twice, averaging 30 seconds at each table (see Figure 7.2).



Figure 7. 2 Talking to students working in groups.

Figure 7.2 provides a striking visual contrast to Figure 5.1 in which I am pictured lecturing from behind the lab bench, separated from my students for the entire class period. Figure 7.2 shows me interacting with students in a relaxed setting, providing myself as a resource for student learning by making myself physically available to my students. In addition to providing students with greater access to me, this practice

of rotating to each group throughout class enabled me to participate in student groups, listening and contributing as an equal member. This change provided me with access to students who never volunteered to speak in whole-class interactions, enabling me to assess informally student understanding of concepts on a minute-by-minute basis and to re-direct student thinking and to make changes to my lesson plans as they unfolded rather than after the fact. In addition, this increased contact with students provided me with opportunities to monitor the “health of the classroom” as I was able to catch snatches of student conversations all over the room that provided constant feedback concerning the quality of student interactions and their receptiveness to class activities.

7.5.2 Increased Agency for Some Yields Decreased Resonance for Others

Structural changes such as these were instrumental in leveling the playing field between low- and high-achieving students because students who historically had little access to teachers who generally remained positioned at the front of the room were now able to carry on individual one-on-one conversations with me in the classroom. In addition, increased engagement during class provided us with opportunities to continue to reinforce the changing social structures that were developing in the overlapping fields of cogenerative dialogues that occurred outside of the classroom. During this time period, changes were suggested and implemented at break-neck speeds. Many of these changes resulted in positive experiences for the majority of the class. However, as classroom structures changed to meet the needs of students like Jaydon and Chandra, new contradictions, such as equitable access to the teacher as a resource, emerged. These changes required a process of re-evaluating the classroom through continued cogenerative dialogues. Regaining a sense of balance in the class was difficult to achieve for many reasons that are explored in the following chapter.

During the third marking period, in which the majority of my students saw the greatest gains in their grades and confidence in chemistry, high-achieving students like Mark and Yanque began to disengage, performing poorly on exams, missing homework assignments, and choosing to work as individuals rather than be involved in group activities. I began to recognize that in my attempts to provide greater support for students who had not performed well in the past, I failed to provide the

support that high-achieving students like Mark and Yanque would need in order to successfully adapt to all these structural changes. The classroom practices Mark and Yanque had developed over time that had previously enabled them to be successful students were now failing them in this newly restructured classroom. Some of the structural changes that benefited students like Jaydon and Sara resulted in a decreased resonance for Mark and Yanque because the practices and dispositions that had once supported their learning were no longer valued.

As the school year continued, it became increasingly clear to Sarah-Kate and me that the classroom was not an especially comfortable space for all students. This was particularly true for Mark as he alluded to in his narrative earlier in this chapter. Encouraging student input opened the door for some students to begin voicing their opinions about any number of things, including other students. Although Mark's peers were not yet verbally responding to his target student practices, video analysis from this time reveals that some students were engaging in dismissive and disrespectful behaviors towards Mark such as eye-rolling, repositioning of gaze, and talking while he was talking. In late February, Sarah-Kate had a cogenerative dialogue with Yanque in which she explicitly addressed some of the behaviors she and I were seeing in the classroom.

Sarah-Kate: I was thinking about some things this weekend. I was thinking about when Mark answers questions or rephrases what Ms. Martin says.

Yanque: You want me to comment on that?

Sarah-Kate: Yeah.

Yanque: All right. A lot of students, including me get annoyed because he talks more than Ms. Martin *does*. I mean, I get it so I don't need him to repeat it for me. But, um, a lot of other students, they get fed up with him because they're like, oh, well, he thinks that he is smarter than everybody else. You know, blah blah, blah. It doesn't annoy me *until* he talks, like, continuously and doesn't stop. So. (2.0) And I don't know, when he keeps rephrasing what Ms. Martin says, Ms. Martin kind of gets annoyed too. It just seems like he thinks he's smarter than her or something.

Sarah-Kate: Does she allow it? Does she allow people in general to think that they are equals?

Yanque: Yeah.

Sarah-Kate: Is that a good thing?

Yanque: Yeah. But it's um, It's a good thing that she would allow us to, but it's a bad thing when the thing goes overboard. Not that he went *overboard*, but it was to the fine point where, he just seemed, like who's teaching, *him* or *her*? You know?

Sarah-Kate: Do you think that he's doing it to be disrespectful? Or do you think that he just doesn't know?

Yanque: I, I think he does it just because it is part of his personality to do it. Not just

in chemistry class, in other classes. Uh, sometimes, I have a lot of classes with him, except for language. In English class he's big on debating about issues and in math class he'll be thinking of neat tricks of how to solve the problem and stuff.

Until I read this transcript, I had given very little thought to any negative consequences that might arise by privileging the voices of students in my classroom. I had prepared myself to listen to student concerns with regards to my practices as a teacher, but I had not considered that given the opportunity, students may voice concerns they had about other students. While Yanque recognizes that Mark's target student practices are largely unconscious and that this is simply the "way he is," she and many of his peers were unforgiving of what they saw as an aggressive display of his cultural capital in the form of science knowledge. In addition, some students were made uncomfortable by Mark's practices because they felt that his practices in whole-class discussions served as a form of disrespect towards me. Student comments such as, "you don't know more than the teacher" or "let Ms. Martin explain before interrupting her" were common. By the third marking period, students were becoming more and more outspoken in class towards Mark. The following transcript is taken from an audio-recorded conversation between Sarah-Kate and me in late February after I called her to discuss an incident that occurred in class earlier in the day in which some students verbally responded to Mark in a negative and hostile manner that completely threw me off guard.

Sarah-Kate: Okay – so tell me what happened today.

Sonya: Well this afternoon in class, I was really upset because something happened with Mark and some other students. I was noticing what you pointed out earlier – how Mark is always repeating what I say, but slower. And while he was doing it I was wondering, is he saying that for me or for everyone because he says it so slowly. And so he said it very well and I was happy because I thought there, now everyone will hear it twice and in two different ways and you know there was a lot of grumbling in the room. Then someone said "shut up!" under their breath in such an evil sounding tone and another student said "duh!" Well I looked at everyone to say stop. And it made me think I want to address this in some way but I was not sure how because I do not want to make him [Mark] feel uncomfortable or uhm, and I am not sure it does. But I do not know where he is coming from. Does he do it to be you know, superior? Or is it just like how he learns, like to say it again out loud because when he says it, it almost sounds like he's saying "so you're telling me"... like it sounds like he is thinking out loud and not like he is trying to show off in any way. And I am wondering if there is some way to find out or to help the whole class understand that people have different ways of learning and they can take something from it other than negativity. You know, so I was really shocked to hear them say that and to be so angry. And it made me start thinking about who his friends are and if

- he has a lot of friends.
- Sarah-Kate: That is one thing Yanque brought up.
- Sonya: Well Yanque may not be the best one to consider.
- Sarah-Kate: Well yeah, but half the time she was saying he was doing it to show off and half the time, she was saying I just want to be better than him. Yeah – but she does see what other kids are seeing too.
- Sonya: Yeah, but this was, the frustration level of the students was pretty high at that point and I was really shocked...I just do not understand. I felt relieved when Mark gave this beautiful explanation. But I wonder if I should address the class in terms of our learning community? But I do not want to make anyone uncomfortable because I know they will all know I am talking about him. He will be gone on Thursday and Friday, for choir, so I thought maybe that was a good time. Then I thought of course he should be included. Then I thought, maybe I should talk to him first about the situation and what I will talk with the class about. But is that my role? But I think maybe it is. But I think maybe it is a peer thing. I just do not know what to do, but I want to do something.

This transcript represents a turning point in our classroom. I began to recognize that our classroom was not a safe place for all of my students. My participation in cogenerative dialogues with Mark, his father, and his peers during the month that followed this incident enabled me to recognize some of the ways in which my practices as the teacher had unconsciously contributed to this situation by supporting two opposing structures. On one hand, I worked diligently to encourage greater student participation while simultaneously maintaining a structure that privileged Mark's voice over that of his peers. My practice of calling on Mark when I needed the "right answer" so I could move forward in the lesson unfairly positioned him as a "know-it-all." I positioned Mark in the role of the "go-to guy." In addition, my actions were often inconsistent with relation to Mark and other high-achieving students because I felt frustrated by what seemed like apathy on their part when being asked to work in peer groups. I felt frustrated and disappointed in their behavior because I felt they were detracting from the positive experiences of their peers who were finally enjoying science. My unvoiced frustrations did not go unrecognized by students in the classroom and may have contributed to a growing undercurrent of tension between high-achieving and low-achieving students in which many high-achieving students felt they were less a part of the "learning community" than their peers. This unspoken tension left Mark feeling "pushed out" of class and "disconnected from others." In the following narrative, Mark refers to the cogenerative dialogue held between him, his father, and me in which we discussed how these feelings of isolation contributed to Mark's decreased participation in class,

his drop in grades, his problematic relationship with his peers, and his aggressive target student practices in the classroom.

I knew from basically the beginning of Chemistry in 10th grade that I could be Ms. Martin's star student. At first I think she was a little put off by my brash confidence. Not that she wanted to belittle me, but I was really too cocky going into it. After about the second quarter I started to stop caring. My work wasn't as well done, and sometimes not turned in. My average began to slip some, but my test scores were always high enough to hold my grade up. I consider it unfortunate now, but I basically blew the course off after awhile. By the end of the year, when it was really too late I was back on track, but I felt bad because I knew how much I had let Ms. Martin and my classmates down as a student. I had an A all year, but I still didn't live up to my true potential, simply for my work ethic. I still think highly of the class as a whole, but not of my own performance in it. (Mark, February 2004).

Mark's account of his experiences in second semester addresses some of the contradictions that he and his high-achieving peers were attempting to resolve, namely how to re-tool his schema to value the role of collaborative learning over that of the individual. During the next two months, Sarah-Kate and I participated in a variety of cogenerative dialogues with different students to identify, discuss, and resolve contradictions arising from our restructuring of the classroom. Specifically, we focused on the ways in which our re-structuring the classroom to better resonate with students like Jaydon and Sara had resulted in decreased resonance for students like Mark and Yanque.

Through cogenerative dialogues and reflection, I recognized that the classroom structures in place provided little room for students to work in the ways that best suited their individual learning styles or preferences. My emphasis on group work and collaboration posed a great challenge for some students, like Mark and Yanque, both socially and academically. For students' whose prior experiences emphasized the importance of individual success and competition (such as getting the highest grade), buying into being responsible for the learning of your peers is not an easy transition to make. Cogenerative dialogues with Mark, Yanque, and two other high-achieving students in which we discussed the classroom interactions described above revealed a level of dissatisfaction among these students that helped me realize that I needed to re-evaluate classroom structures yet again. In these conversations, I learned that all of these high-achieving students harbored a certain amount of

frustration and negativity towards their peers and me for making changes to class structures that truncated their agency.

In retrospect, I agree that the voices of students who were struggling in class were privileged over those who were not. This was not done consciously, or with any intent to deny these students an equal stake in re-structuring the class, but simply because it did not occur to me that high-achieving students would suffer due to these changes. In addition, their struggles were not immediately obvious to me or to these students. Mark and Yanque reported that they felt a certain degree of guilt and selfishness surrounding their frustration because they were genuinely happy for their peers' achievement in science class; however, they were frustrated that we did not recognize their sacrifices (in terms of grades and loss of status derived from "knowing" science) and their struggles to support their peers in cooperative group work which they felt limited their own learning.

7.5.3 The Re-negotiation of Roles (and Rules)

Students were not the only ones made uncomfortable by the snowballing effect of changes in our class. As the classroom structures continued to change, so did the roles we were each expected to play. During this time period of great change, I began to notice that many of the social boundaries once existing between my students and me were beginning to blur. I was both pleased and worried by this development. I felt that my students and I were making great gains in the classroom because we had become comfortable enough with one another to express honestly our opinions about how best to teach and learn science. However, as the structures continued to change and student-teacher boundaries became less clear, I recognized I had to find new ways to negotiate the changing power dynamics in the classroom. I no longer felt comfortable in my role as disciplinarian and began to defer more and more often to "the class" to determine how we should proceed during activities. On the whole, this was a very positive experience for me as I found students to be responsible and thoughtful the majority of the time.

However, it was becoming clear that "the class" no longer included the voices of all my students – namely the top three students in the class. In addition, my own discomfort grew as student familiarity increased, leaving me feeling conflicted and uncertain about my changing role as mentor and friend. As classroom structures

continued to change, students continued to renegotiate their individual roles in relation to their peers. Uncertain how to manage the newly evolving social dynamics in the classroom, I was unable to provide the structure students needed to interact positively with one another in the new roles they were taking on. For students like Mark and Jaydon, their understanding of their respective roles in class were based on their past historical and cultural experiences in school. Just as Jaydon's past experiences with and in science had positioned him as someone who *did not know* science, Mark's past experiences with and in science positioned him as someone *who did*. Treading uncharted territory, my students and I began to struggle as we dealt with this reversal in our respective roles. In the following chapter, I address the extent to which we were able to successfully re-negotiating these roles and re-structure the class to be more inclusive of both high-and low-achieving students.

This chapter examined the role of cogenerative dialogue in altering classroom structures that transformed the learning environment by changing my assessment and teaching practices as well as altering the ways in which my students and I interacted both within and outside of the classroom. This chapter also examined the ways in which multiple, overlapping fields of cogenerative dialogue enabled my students and me to reflect on our individual practices in an effort to affect collective change that afforded greater student agency. The extent to which these changes afforded individual and collective agency were examined by focusing on the ways in which two different students experienced these changes in the classroom. The following mini-chapter concludes with an examination of the transformative power of this research as I explore the extent to which these structural changes afforded student and teacher agency that was sustainable across fields (in other classrooms, the school, and other social interactions) and time (during the end of the school year and over the two years following this research).

CHAPTER 8

WHAT DOES “SCIENCE FOR ALL” MEAN IN THE FACE
OF ONE-SCIENCE-FITS-ALL ASSESSMENTS?

Don't bring the science to students. Bring the students to science. Ms. Martin did that. She let us come to it [science] in our own different ways. (Mark, Pre-Service Teacher Education Workshop, February 2003).

Participating in a February 2003 workshop with pre-service teachers and student-researchers from different DUS classrooms, Mark offered this advice to pre-service teachers about how to motivate students to want to learn science. While I feel that Mark's words describe what I hoped we could achieve in our classroom, events occurring in the last few months of the school year conspired to diminish the effectiveness of many of the changes we had collectively implemented in the proceeding months. Already loosened by the events described in the last chapter, the wheels came off our experimental wagon in early spring as we ran head-long into a barrage of city, state, and national standardized exams that kept whispering the words “teacher accountability” in my ears.

Described in detail in chapters 2 and 4, the school community (including administrators, teachers, students, and parents) was deeply vested in maintaining an image of excellence supported by high scores on a variety of assessment measures that are widely publicized in the region. Thus, student performance on these standardized exams were of great importance at Urban Magnet. An initiative at the national level tying student performance to teacher and school performance “upped the ante,” placing a greater emphasis on student preparedness for these exams in particular. Up to this point in the school year, my students and I had enjoyed a relatively high degree of autonomy in the classroom which enabled us to implement a series of structural changes that moved us away from individualized assessment towards a community focusing on our individual responsibility for the learning of all classroom participants. However, structural changes outside of the classroom necessitated that my students and I change our teaching and learning practices in an effort to conform to school administrators' and parents' expectations of achievement of high scores on these exams. This necessitated that we make more changes in the

classroom, shifting towards direct instruction and individualized assessments. These changes introduced contradictions in the classroom that resulted in decreased agency for students like Jaydon and Sara who had fewer opportunities to access their peers in small groups as a resource for their learning. On the other hand, for students like Mark and Yanque, these changes represented a classroom structure they recognized as “being more normal.” My agency as the teacher was also affected during this time period as I struggled to prepare students for an external exam that was fundamentally divergent from my evolving schema regarding the teaching and learning of chemistry.

This chapter provides a brief epilogue of the structural changes that took place in our classroom in the last three months of the school year. The changes were in response to larger structural changes that were taking place in the school district due to the implementation of new state and federal education policies mandating increased accountability of schools, teachers, and students as measured by scores on standardized tests. The chapter concludes with an examination of some of the questions that emerged as we ended our year of classroom research and began to reflect critically on how these experiences would affect our lives in the future.

8.1 ARE THEY PREPARED?

The end of the school year was a hectic time for all Discovering Urban Science (DUS) teacher researchers as we struggled to make up for lost instructional time taken up by city- and state-mandated testing. During this time period, Linda and I had less time to reflect collectively on our classrooms, and attendance at weekly DUS meetings became more sporadic as teachers attempted to meet the changing needs of their schools and students in anticipation of the impending season of exams. The fourth marking period (April-June) brought with it over three weeks of standardized testing, including a citywide science exam, the state-administered PSSA, the SAT II Chemistry exam, and the AP Chemistry exam. Only five months after President George W. Bush signed the new No Child Left Behind (NCLB) Act³⁷ into law, Philadelphia public schools were taking part in the first round of new high-stakes exams that were sweeping the nation. NCLB serves as a reauthorization of the

³⁷ Information pertaining to the NCLB Act comes from the U.S. Department of Education (2004) Publication: Public Law print of PL 107-110, the No Child Left Behind Act of 2001.

Elementary and Secondary Education Act (ESEA), which is the central federal law in pre-collegiate education. The ESEA was first enacted in 1965 and last reauthorized in 1994. The ESEA encompasses Title I, which is the federal government's flagship aid program for disadvantaged students.

Coming at a time of wide public concern about the state of education, NCLB legislation set into place requirements that reach into virtually every public school in America. At the core of the reform are a number of measures designed to drive gains in student achievement on standardized tests and to hold states, schools, and teachers more accountable for student progress (Winerip, 2003a; 2003b). In December of 2001 (just one month before President Bush signed NCLB into law), the mayor (whose child attended Urban Magnet) and the governor of the state dissolved the Philadelphia School Board and appointed a five-member school Reform Commission to address district-wide low achievement on standardized tests. In addition, a number of neighboring high schools had been “taken over” by the state and were now being run by private for-profit companies, such as Edison Schools, Inc (Raven, 2003). Low student performance on the citywide exams carried with it a threat of such a take-over and/or decreased funding for special programs; as a result, many district schools were under a great deal of pressure to score well on these exams. This prompted a series of structural changes by school administrations that had a direct impact on teaching and learning in classrooms across the district.

At Urban Magnet, regular classes were suspended for all students involved in the citywide assessments (including 8th and 11th grades) so that teachers could focus their classroom instruction on material to be covered on these exams. Even though they were not subjected to the city and state exams, sophomores were not exempt from the testing frenzy. Classes were suspended for all tenth-grade students for a full week of PSAT (Pre-SAT) testing prep that required all classroom teachers to “monitor” their students during the mandatory administration of a Kaplan³⁸ test prep session that was held in the cafeteria. Teachers lost nearly a month of classroom instructional time.

³⁸ Kaplan is an internationally recognized test preparation organization. Schools and individual students can, for a substantial fee, receive special training focused on test-taking skills for specific national standardized exams.

At the same time, I was involved in weekly science department meetings concerning student preparedness for exams in which we discussed how we were individually meeting the needs of our students for test preparedness. I felt there was very little I could do to resist the structural changes taking place in the district and at Urban Magnet. After working so hard to remove structures we felt negatively impacted the teaching and learning of science in our classroom, this unexpected and uncontrollable hail of testing seemed that much more unbearable to my students and me. Once again, it seemed that structural changes from outside of the classroom (in this case schema related to testing and accountability), would act to truncate our individual and collective agency to teach and learn science in ways that afforded us our personal goals of “coming to science in our own ways.” As a result, I felt we needed to reevaluate classroom structures so that we could renegotiate our individual teaching and learning goals within the context of the larger structural limits set down by the district’s new testing mandates. These changes necessitated that my students and I engage in practices that would enable them to be successful in taking standardized exams, something we had not focused on previously. In the following section, I describe some of the structural changes implemented to strengthen student performance on these exams and some of the contradictions that arose as a result of these changes.

8.1.1 Struggling to Meet the Needs of All

When this research began, my goal was for students to have an increased appreciation and enjoyment for learning chemistry. Walking a tightrope throughout the year, I had attempted to maintain a balance between two competing forces: student enjoyment and student learning. Up until this point, I felt I had witnessed significant evidence of both occurring simultaneously. However, as my students and I poured over the SAT II test questions, we were dismayed to discover how much information was yet to be “covered and learned.” A significant number of students who elected to take the SAT II were students who were characterized as low-achievers in the past. In previous classes, only the highest achieving students (both in chemistry and in the entire 10th grade) signed up for these exams. As a result, I found myself in the position of needing to prepare both students like Mark whose goal it was to “make a 800 [a perfect score] on the exam,” and students like Chandra who stated she wanted to “feel confident about what I do know” and “just do what I can.”

This change provided evidence that the changes made during the year had afforded more students access to the exam.

Whether or not these students would be able to appropriate the skills and dispositions they had gained from their participation in these alternative structures to perform well on this external exam remained to be seen. To provide students with more resources to support their learning, I instituted a SAT II preparation program for all students taking the exam because I wanted to ensure that students were afforded every opportunity available to ensure their success on the exam. Sixteen of my students elected to take the SAT II in Chemistry. In preparation for the exam, we met for seven weeks before the mid-May exam date to study. My students and I explicitly discussed ways to align our test preparation method with the needs of individual students because we recognized not all students shared the same goal or reason for taking the exam. Some students simply wanted to “try” the exam, while others anticipated receiving college credit for their scores. Realizing that different end-goals may translate into different levels of commitment to the group preparation effort, students negotiated diverse roles within the group. As a group, we evaluated several test prep books to guide us. Students decided to purchase two different sets of texts so they would have access to a greater number of practice exams and because each text offered a different approach to covering the material. Each student committed to developing a study guide for his or her classmates on two assigned chapters so that he or she would have access to a study guide covering each chapter in the text. In addition, students agreed to meet with me three times a week during lunch and twice after and/or before school to study for the exam. In these sessions, we covered not only content-related questions, but also test-taking skills and timesaving tips.

All 16 students took it upon themselves to meet independent of our joint sessions, appropriating the social networks they had developed in chemistry as a resource for their learning outside of the classroom. I found small groups of students huddled in hallways, pouring over their textbooks in the cafeteria, and working problems on chalkboards in empty classrooms all over the school during all times of the day. In addition, students created and shared a variety of mnemonics, algorithms, and other memory devices to cope with the significant amount of memorization required for the exam. Students arranged to meet one another on the weekends away from school

to study and even arranged to have upperclassmen that had previously taken the exam lead some of their study sessions. It is important to note that the majority of this preparatory work occurred outside of our regular chemistry class, meaning students were individually responsible for reading, reviewing, taking notes, and solving problems largely on their own. These measures are all examples of student agency directed towards both their individual and collective goal of performing well on the exam. In the following section, I detail some of the structures I provided during in-class instruction to support their preparation for the exam.

8.1.2 Making up for Missed Time

Influenced by what Ronald Anderson and Jennifer Helms (2001) characterize as a preparation ethic, I developed an “overriding commitment to [content] coverage” due to my “perceived need to prepare students for the next level of schooling.” In an attempt to make up for missed time, I became obsessed with covering three more chapters in our text before the exam. In doing so, I began to rely on lectures and worksheets in an attempt to transmit as much information as possible to my students in a very limited period of time. I felt the structural changes in the district assessment policies necessitated a return to these more conventional teaching practices. I began to re-introduce teaching practices that we had collectively identified as sources of frustration and confusion for low-achieving students, but which I regarded as necessary for the dissemination of large amounts of information. These changes in classroom teaching practices may have served to alienate some students, but were received as a welcome addition by high-achieving students for whom these worksheets served as resources for their test preparation. I did not completely abandon group work during the month before the exam, but I did utilize it to a lesser degree than in the past five months. And while my actions changed the structure of the classroom, my practices provided resources for my students as they prepared for the exam.

These changes did not occur without the involvement of the 10 students who chose not to take the exam. In a whole-class cogenerative dialogue, we discussed the changes we felt were necessary to ensure that students had at least “seen the material once before the exam.” Supported by high-achieving students who stood to benefit from the changes and accepted by middle- and low-achieving students as the best

way to support the learning of their peers, we implemented new changes that supported a more didactic teaching role for me in which I “fed information” through lectures, reading assignments, and copious worksheets. As is always the case when shifting structures, there were changes in both student and teacher agency during this period. As classroom structures changed to rely more on direct instructional methods, the balance of student agency shifted as these teaching practices resonated more with high-achieving students than with low-achieving students. A testament to the solidarity that had developed between us during the year, all the students supported this proposal to revert to a more traditional classroom “until we had taken the exam.” Students for whom these changes presented the greatest challenge agreed that it was “only fair” that their peers have every advantage before the exam as these students acknowledged that the needs of their peers were not easily met by classroom structures that supported time-consuming, inquiry-based activities.

8.2 MAKING THE CASE FOR COGENERATIVE DIALOGUES

Structural changes implemented at this time signaled a return to the status quo for students who had enjoyed success in science for the first time in their lives. In a classroom that relies heavily on lecture, there is less room for student questioning and discussion. Both were casualties of this time period. My students and I were unable to maintain the open line of communication we enjoyed before the test preparation period simply because there was no time left for discussions about anything other than chemistry. The structure no longer afforded us the opportunities we needed to reflect on the changes we were implementing, let alone consider the consequences of our actions. As my use of group-work decreased, I found myself more often positioned at the node of the chalkboard where I lectured sometimes for the entire class period. No longer engaging students in group-work, there was less need for me to circulate around the classroom. As a result, my students and I had fewer opportunities to participate in classroom huddles.

These changes in my teaching practices served to separate me from my students and left less room for student voice, both in the classroom and out. One student-researcher, Markita, described me during this six-week period “as Dr. Jekyll and Mr. Hyde.” Changes that limited student involvement in group work and class discussion did not resonate well with some students and created tension between students and

me who, like Markita, felt I had “turned on them without warning. It was like you were one way and then another [way]. I wasn’t sure what we could and could not talk about with you anymore cause you seemed more like a regular teacher.” Markita’s comment reveals a growing level of hostility and frustration shared by some students in class towards me, their high-achieving peers, and chemistry class in general. Students who once utilized their peers as resources for their learning were now expected to work independently on worksheets that symbolized “what all science classes were always like.” In contrast, students like Mark expressed some relief that he was “learning chemistry again.” In retrospect, it is easy to recognize the ways in which these structural changes truncated the agency of some students while affording the agency of others. No longer able to lay my finger “on the pulse of the classroom,” I was unable to gauge the successfulness of our classroom interactions. As a result, it was not until the exam was over and cogenerative dialogues resumed that I began to understand the extent to which these structural changes had affected my relationship with my students and their relationship with their peers and science.

The following excerpt is taken from a reflection by Anna who responded to a writing prompt on an end-of-the-year survey entitled “one thing I would change about this year”:

In the beginning of the year I was very intimidated by chemistry. I had the impression that it was very difficult to understand and it took a lot of work including math work. Then after the first month of school passed, I began to get used to chemistry and feel confident about it. It took a lot of work but I could do it and it was good because I was supported by my friends while learning. As the year progressed my overall feelings towards chemistry were that it was okay because it took a lot of work to understand it on my part and also due to the fact that before I didn’t see it as being very relevant to my life. Today, just having completed the chemistry course, my feelings are mixed. My feelings are mixed because I struggled with chemistry at the end of this year. We went through the material very quickly so there wasn’t an opportunity to get much practice with it. My other schoolwork also influenced my views on chemistry throughout this term. I had a lot of other schoolwork including finals. Due to the fact I had to study for finals and there was an increased workload I had even less time than normal to study chemistry. Also, we weren’t able to work in groups as much. I need time to fully understand the concepts taught and I need to talk it out with others, so this made it harder. This term was rushed and I felt as if the information was just touched upon quickly but I was still expected to know it the same. For these reasons I was frustrated and a little angry towards you and chemistry (Anna, Final Survey, July 2002).

When I first read Anna's reflection, I was very upset because I shared her frustration, anger, and sense of helplessness. All 25 of Anna's classmates reported they felt negatively affected by the end of the year testing experience. High-achieving students like Yanque and Mark indicated they were more forgiving of the changes I implemented during the pre-test period because they "saw the need for it" or "understood it would help them on the exam." In a conversation with Yanque, Mark, Danny, Jaydon, and Chandra, I asked why these students thought we did not continue to "discuss and cogenerate solutions" about what we were all going through during the pre-testing period. Yanque offered, "It [mandatory testing] was an issue happening outside of class. Nothing we said in class could change what was going to happen and what we had to do to be ready for it." This comment raised several questions for consideration. Specifically, we wondered how being assessed by a "one-science-fits-all" exam provided students and teachers the flexibility needed to create a learning environment where students could "come to science" in their own unique ways.

Today I feel I could almost justify the changes we implemented if all of the students in the class had been equally vested in preparing for and taking the exam. As it is, I feel I let down students like Jaydon, Chandra, and Sara who had taken such huge risks during the school year to reach out to their peers, to me, and to science. Finding ways to equitably and fairly support the learning of all students simultaneously is very complex. Attempting to do so without providing a means for my students to communicate effectively their individual needs to me and to their peers made it practically impossible. Although the value of cogenerative dialogue was not fully realized at this point in the research, these experiences heralded the emergence of cogenerative dialogues as a necessary component for not only catalyzing change, but also sustaining agency over time. An evolutionary process, we began to recognize ways in which our experiences in cogenerative dialogue and classroom huddles served as resources for us as we learned how to interact with one another in positive ways. These social interactions afforded us with resources needed to address contradictions that emerged in response to structural changes we implemented to improve the classroom. These findings proved to be substantial in structuring interactions between students and teachers at future sites of research.

8.2.1 Looking Forward

My students and I were left with many questions at the end of the school year. We wondered how the changes we had implemented in the classroom would influence our futures as teacher and students. Would there be unforeseen consequences for restructuring our classroom? Was this experience helpful even though none of their other high school classes were structured in this way? Would they be at a disadvantage in future science classes? How had these experiences benefited students? In an effort to answer these questions, I maintained more intensive contact with eight students (and their parents) over the next two school years and into the first semester of their freshman year in college. In addition, I collected data from almost all members of the class about their junior year in Physics through on-line surveys, electronic correspondence, and discussion during attendance at a variety of school functions such as sporting events, plays, and graduations. Analysis of these data has provided some answers to the questions that emerged at the end of the school year and are addressed in my discussion of the authenticity criteria of this study in the following concluding chapter.

8.3 CONCLUSION

In this chapter, I have highlighted some of the difficulties that my students and I faced during the last quarter of the school year when we temporarily moved away from cogenerative dialogues, as well as some of the successes we enjoyed despite the challenges presented by the structural changes that occurred in the school and in our classroom. In previous chapters, I highlighted the transformation of my assessment practices and the experiences of different students to demonstrate how the structures of our classroom evolved over the course of the research. I drew on both micro- and meso-level findings to illustrate how these changing structures enabled some students to build positive emotional energy with science and solidarity with both me and their peers which afforded some students greater agency in the classroom. In addition, I examined the ways in which the transformations in classroom structures were recursively tied to the multiple overlapping fields of cogenerative dialogues held with different participants in the classroom. Chapters 6 and 7 discussed how the evolution of these cogenerative dialogues allowed us opportunities to develop positive associations with science while simultaneously building and exchanging social, symbolic, and cultural capital with both their peers and me. On a macro-level,

the data presented in the last three chapters suggest that the changes I implemented in my assessment practices were afforded by the solidarity I was developing with my students. In the next chapter, I return to the initial questions posed in the beginning of the dissertation as I more closely examine the findings of this study within the macro perspective of science education today.

8.4 CODA

This section provides a snapshot of some of the events from the last six weeks of the school year as well as information about student performance on the SAT II. Of the 16 students who took the SAT II Chemistry exam, 10 scored a 590 or higher – scores which might release them from a semester of science at a number of 2- and 4-year colleges. (Mark was disappointed that he scored only a 790 out of a possible 800). The other six students scored between 480 and 580, a perfectly respectable score for a high school sophomore taking chemistry for the first time. During the final six weeks of the school year, my students and I focused solely on the development of their individual video ethnographies and student-driven collaborative inquiry projects. During this time period, students worked in groups to investigate such topics as the chemistry of lava lamps, how different polymers were made, and why glow-sticks stop glowing. Students became experts on topics of their choice and developed interactive teaching units to present the information to their peers. Students used plays, demonstrations, Power Point media presentations, and interactive games to teach and assess peer learning.

In the final weeks of class, we engaged in some very special activities that included several field trips and inviting guest speakers to our class. Most notable of these involved a class trip to an evening show of *Copenhagen*, an award-winning play based on the uncertainties surrounding the 1941 meetings between physicists Niels Bohr and Werner Heisenberg. In addition, we invited several guest speakers, including Dr. Alan MacDiarmid who won the Nobel Prize in Chemistry in 2001 for his discovery and development of conductive polymers. Dr. MacDiarmid brought his Nobel Prize to class, allowing us all to have our photo taken with him while holding the medal. During his visit, he shared with students why he enjoyed science, presented a fun demonstration using liquid nitrogen, and encouraged students to be life-long learners – whether in science or any other aspect of life. Students reported

that these two experiences were especially appreciated because they felt it gave them opportunities to consider the impact of science throughout history and allowed them to see science in the world around them.

CHAPTER 9

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

In this concluding chapter, I re-examine the findings from this study in conjunction with the questions posed at the beginning of this dissertation and in the broader context of the current state of education. In doing so, I revisit some of the challenges associated with urban education as introduced in the first chapter. I pay particular attention to the difficulties experienced by teachers and their students when positioned as historical, social, and cultural others with respect to one another. Using cultural sociology and the sociology of emotions, I present a case for cogenerative dialogue as a pathway for transforming science teaching and learning in the urban classroom by linking the micro-and meso-level findings from previous chapters to a macro perspective. Finally, I examine the authenticity of the study using Guba and Lincoln's (1989) criteria and offer implications that these findings raise for teacher education programs and for reforming education policies at the state and national levels.

9.1 SUMMARY

I began this dissertation by asking whether opportunities for success really exist for all children, whether or not all of America's youth can really "be what they wanna be." However, even a cursory glance at the state of education in America's rural and urban schools suggests that the same opportunities for success do not exist for all students. Plagued by fiscal crisis and staffed by underqualified teachers with access to few material resources, urban schools offer a particularly bleak future to the students they serve. For minority students and those living in poverty, prospects are even more dismal. In the past, "otherness" has been used to provide a causal explanation for low achievement by poor minorities, specifically those in large inner cities. As a result, educators have tended to take a deficit perspective of student-teacher difference, blaming student failure on the culture of their homes and the influence of their neighborhoods (e.g., cultural poverty theories; Ladson-Billings, 1994; Ogbu, 1978; Toussaint, 1997). This research moves past these deficit models to examine the cultural differences between teachers and their students in an attempt

to explore the ways in which differences shape the learning environment, and hence, student and teacher possibilities for success.

9.1.1 Setting and Design of the Study

This critical ethnography focused on improving the teaching and learning of chemistry in a diverse urban classroom. The study was situated in my tenth-grade chemistry classroom in an urban magnet high school serving students of differing cultural, social, and historical backgrounds. Participants included all 26 students in the class, a university researcher (Sarah-Kate LaVan) and me as a teacher-researcher. Collaborative research was conducted in the classroom from September 2001 through the end of the school year in June 2002. Student surveys, interviews, and collaborative reflection and analysis of data collected during the school year continued over the next two school years, ending in October 2004. In addition, I served as advisor for and taught science to many of the students in this tenth-grade chemistry class in both their eighth-and ninth-grade years. As a result, this dissertation includes data collected over a five-year period.

This study is unique in that it took place in a high-achieving urban magnet school in which students from differing backgrounds experienced both high and low achievement in science classes, including some who failed courses at this school. It is also unique that a classroom teacher and her students were active participants in the research and analysis of the data, thus providing a different view of the classroom than offered by much educational research today. That this dissertation was written nearly two years after the initial research in our classroom began provides a third unique quality, distance and perspective, from which I have been able to reflect on the events in our classroom with other teacher researchers, Sarah-Kate, and many of my students.

Conducted within the methodological and theoretical frameworks of critical ethnography, this research employed collaborative research, autobiographical reflection, and cogenerative dialogue to examine the influence of structure and the social and historical contexts of lived experiences on teacher and student practices in the context of the science learning that took place in our classroom. This research provides evidence of the ways in which structure shapes and is shaped by the practices and beliefs of students and teachers in different fields and how those, in

turn, structure fields and afford agency for both the individual and the collective. The methods employed in this ethnography were designed to catalyze social transformation by identifying contradictions within structures and then finding ways to alter these structures to expand the agency of all those involved. A significant component of the research design included students as researchers. Student participation as true co-researchers has been instrumental to the development of my understanding of the ways in which students experience school and science and vice versa as students learned about my experiences as a science teacher. The collaborative nature of this research enabled us to analyze video (i.e., use video tape of classroom activities manipulated with video editing software) to search for and identify patterns of coherence and contradiction in classroom activities, guide the direction of the research, and transform classroom structures to afford greater student and teacher agency. Comparison of meso- and micro-level analyses allowed us to identify and strengthen teacher and student practices and interactions that created structures to afford teaching and learning in our chemistry classroom.

9.1.2 Focus of the Study

Concerned that in each of my classes about a quarter of my students failed science each year, I began this research to understand how school and classroom structures impacted student success at Urban Magnet and how my practices as a teacher and their practices as students were contributing to student failure. Using the structure/agency dialectic to view the process of teaching and learning chemistry, we examined classroom interactions to identify ways in which we could improve our individual and collective experiences in our chemistry classroom. Specifically, we explored how practices and schema developed outside of the classroom could be transferred to our chemistry class in ways that both consciously and unconsciously transformed the structures of our classroom and, thus the agency of my students and me. We examined the ways in which certain structures afforded student and teacher agency and how capital exchanges in different fields shaped participant practices in the classroom. In addition, we explored the importance in developing not just the strategies that build scientific dispositions for success in the science classroom, but also the need to provide struggling students with tools, resources, and strategies for negotiating other structures to afford their agency in other fields outside of the classroom. Finally, we examined how structures supporting positive interactions

between teachers and students could facilitate greater cultural and social congruence between the two, thereby diminishing the sense of “otherness” that existed between us. The following four overarching research questions guided this study:

1. How do practices and schemas gained by being within school structures afford the structures of the classroom field?
2. How can the structures of the classroom be transformed to allow students and teachers greater exchange of capital (social, cultural, and symbolic)?
3. How does the exchange of capital afford agency for the participants?
4. How can participants’ actions transform the structures associated with school and the classroom to break cycles of reproduction?

Answered in detail in previous chapters, these questions served as the major foci for inquiry during this study. However, as is the case with emergent design, over the course of the study different issues arose that served to refocus our attention towards new questions. Within the scope of a five-year longitudinal study, many questions have been answered and many more have been generated. In an effort to organize and report the findings that are most salient from this research in this concluding section, I decided to revisit chapter 3 in which I provided an autobiographical account of how and why I became a teacher. While reading this chapter, I recognized that the themes that were salient in chapter 3 have reemerged in a more sophisticated and holistic pattern in my final analyses of the research findings presented in chapters 5, 6, and 7. Thus I have organized my concluding thoughts around these larger themes: the importance of research and structured reflection with others over time, the importance of capital exchange in diminishing the role of other, and the creation of inclusive learning environments through collaborative interaction.

9.3 LIMITS OF THE RESEARCH

Over the last five years, research teams from five different schools in the Discovering Urban Science (DUS) study have learned a great deal about relationships between students and teachers and the impact these relationships have on the teaching and learning of science in urban classrooms. Our individual experiences with collaborative research involving university researchers, student researchers, and teacher researchers have contributed a great deal to our collective

understanding of how to conduct this sort of investigation in ways that involve all participants in the classroom and is transformative in nature. Much of what we recognize today as being critical components to developing cohesive learning communities in which students and teachers not only co-generate suggestions for change but also equally share in the responsibility for implementing change come from what we learned in DUS classrooms during the first year of this study. Our current definition of what constitutes cogenerative dialogue and true participatory research has evolved out of the shared experiences of DUS teachers and students from the early stages of this research. Findings from the research conducted in DUS classrooms in the first year of this study have been instrumental in informing decisions about the continued implementation of this research design in a variety of classroom settings and levels (including teacher education programs such as the Master's of Chemistry Education program) in subsequent years.

Some of the lessons learned from the difficulties we experienced within our research team in my classroom have served to improve the design of cogenerative dialogues currently used in other urban science classrooms involved in this study. Specifically, our experiences made clear the need for sustained involvement of all participants in the same fields of cogenerative dialogue over time, not just participation in different overlapping fields of cogenerative dialogues. As already explained in chapter 2, structures imposed by the school (e.g., my teaching conflict with student lunch schedules, etc.) limited my involvement in the early research and lunch meetings between Sarah-Kate and student researchers. The overlapping fields of cogenerative dialogue as we experienced them evolved out of the need for my students and me to communicate our understandings to one another even when we could not meet at the same time. Classroom huddles emerged between my students and me as a means for us to discuss focused change on class activities and interactions occurring “in the moment.”

Impromptu huddles played a critical role in enabling my students and me to make change, but this model of interaction lacked several features of the current model that we recognize as necessary for sustaining change over time. Namely, that transformation occurs and is sustainable when all participants contribute fully throughout the entire process. This means not only actively participating in

discussions to suggest change, but also sharing responsibility for implementing suggestions and for attending to the outcomes. Limiting the potential for sustaining transformation in our classroom was our inability to participate in one conversation with all the participants present at the same time. This affected not only interactions between my students and me, but also between different groups of students. For example, Jaydon and Mark never participated in the same cogenerative dialogue, research meeting, or classroom huddle at the same time. Although unintentional, the consequences were great. As a result of this differential involvement, some student voices were privileged over others based on who was involved at any certain time and the amount of capital these students shared with the other participants in these dialogues. Thus, had more high- and low-achieving students been involved in the same overlapping fields of conversation from the beginning of the year to the end, we may not have suffered the see-saw affect caused by the unbalanced representation of student voices in first (low-achieving students) and second (high-achieving students) semesters.

Many of the difficulties we faced as individuals may have been avoided or at least reduced had we had the opportunity to participate in more cross-classroom conversations with all stakeholders present at the same time. Understanding the need for this structural change in the way cogenerative dialogues were implemented required that Sarah-Kate and I recognize the value of participants with differing goals partaking in the same conversation at the same time. When we asked students to join the research group at the beginning of the school year, we understood the importance of having students involved who represented a cross section of the class. However, we chose students to provide different perspectives based on our belief that we would be learning from these students what it might be like for students “like them” to learn chemistry in this classroom. Our experiences with student researchers over time challenged our schema regarding the purpose of student participation in the research because we learned that teachers are not the only ones who stand to gain by listening to students. Supported by many student accounts throughout this dissertation is the need for students to interact and discuss with their peers their experiences in school and in science. In this way, cogenerative dialogues serve as a seedbed for the production of culture that students and teachers can draw upon and enact in the classroom to support their teaching and learning.

Finally, our findings made clear the need for teachers and students to participate in structured conversations that explicitly define the roles and rules for initiation of and participation in cogenerative dialogues. This includes deciding how, when, and with whom cogenerative dialogues should occur, in addition to what topics should be discussed. Relying on Sarah-Kate as the connection between our overlapping conversations, my students and I had little practice in approaching one another to set up these more formal discussions. This was not recognized as being problematic until the end of the semester. Identifying this “gap” was important because it allowed us to recognize what features of cogenerative dialogue were salient. Given the opportunity to continue our research or to have begun anew, we would have modified the design to ensure that all stakeholders had equal access to research meetings and cogenerative dialogues. True to the educative and catalytic nature of this research, our findings were shared with teachers, students, and researchers in the DUS study in an effort to afford greater possibilities for expanded student and teacher agency over time and across different fields. Our present day experiences have taught us that cogenerative dialogues work best when they occur frequently, involve a variety of participants, and are relatively small in size – but that a mix of large (whole-class) and small group interactions are best.

9.4 CONCLUSIONS

9.4.1 The Importance of Classroom Research and Structured Reflection

Making the transition from what Schön (1983) refers to as the “defensive expert” to that of a “reflective practitioner” requires a process of self-examination that is difficult and sometimes painful. Describing her experiences as a teacher-researcher of her own classroom teaching practices, Wendy Schoener (Ulichny, P. & Schoener, 1996) states that she learned that she cannot “divorce who I am from how I teach” and that while she will always face difficulties in her teaching, she now recognizes that the “greatest possibilities lie in paying attention to them.” These words have remained with me while writing this dissertation because they resonate deeply with my own experiences as a teacher-researcher. In fact, they form the kernel of my concluding arguments for this research. The potential to transform the classroom lies in knowing oneself as a teacher and/or learner, and that only by collectively seeking to expose and examine the structures associated with the process of teaching and

learning can contradictions be resolved to afford greater agency for all classroom participants.

By deliberately acting to identify individually and collectively the ways in which our unconscious actions impact others, we became more aware of the roles we played in structuring the classroom. As a result, individuals were afforded the ability to enact practices with intent and directed agency – a process through which cycles of social reproduction were recognized and broken – providing my students and me with real opportunities for change. In this sense, our critical awareness of classroom structures helped to diminish determinism and reduced possibilities for social reproduction by allowing the agency (of both my students and me) to be directed with a clearer understanding of the obstacles that prevented our access to and/or appropriation of the resources we needed to meet our individual and collective goals of learning science.

9.4.2 Autobiographical Reflection and Video Ethnography

This research makes clear that the mere act of reflecting on one's practices does not ensure that a need for change will be recognized, much less implemented. My students and I discovered that making changes and sustaining those changes over time was an incredibly difficult process. This is largely because my students' and my practices are so deeply rooted in our past social, historical, and cultural experiences with one another and with schooling. In addition, we were limited by the larger structures of the school that did not readily support our evolving vision of what constituted good teaching and learning. This is why our individual experiences utilizing autobiographical reflection and video ethnography as research tools were so powerful. Through autobiographical reflection, analysis of our individual practices recorded during classroom interactions, and analysis of student-produced video ethnographies, my students and I were able to become critically aware of one another and ourselves. As a result of our research and analyses of our own lived experiences, we began to recognize the impact our actions had on others and vice versa. In addition, this process of structured reflection with others took place over time. Conversations surrounding video of our classroom interactions changed as our social bonds strengthened. This process took time because my students and I had to learn to trust one another, learn about one another, learn to become critical of our actions and

interactions (using video and audio analysis, interviews, journals, and collaborative research meetings), and then bring all of this back to the classroom to inform our changing practices. This process involved a great deal more than just “reflecting” or writing “reflections” in journals. We were engaged in a process of reflection and discussion that was shaped by a larger structure, the methodology of this research. The schema and resources that were associated with the theoretical and methodological frameworks of this research design structured our interactions and practices. This is significant because my students and I accepted the ideology espoused by this research: that we could transform our classroom by engaging in this collaborative effort.

The design of this research provided us with a structure (including the resources and schema) needed to transform the ways in which we interacted with one another and with science. There is a saying that “once you look at things in a different way, you start to see things differently.” The process of reflection and research in which my students participated in enabled us to “start to see things differently” because it provided a structure from which to “look at things in a different way.” This process differs from the traditional action-research and class reflection in which many teachers are asked to engage because it is built upon and shaped by a set of schema and resources that enables participants to produce a culture of research that is lacking in some of these other forms of classroom research.

Understanding the ways in which my personal beliefs about the world, science, and science education shape my teaching practices has been key in developing my understanding of the ways in which my practices shape the experiences of students in the classroom and their possibilities for succeeding in science. Before my participation in this research, I had given very little structured thought as to how I interacted with my students or even why I enacted some teaching practices and not others. I relied on a trial-and-error method of teaching, never reflecting on why certain practices were more effective than others, only recognizing that “some things worked and some others didn’t.” This is the limit of reflection provided by many action-research models and very few of these models include students in the process at all. Most students stated that other than recognizing that they seemed to perform better in some classes and with some teachers as opposed to others, they had not

given much thought as to how or why this was so. However, this research provided students with the structure they need to examine critically their own practices and relationship with others in the classroom. An example of this comes from Danny as she compared her experiences as a sophomore in chemistry and as a junior in physics:

Before chemistry class, I really only thought of teachers as being good or bad at teaching or me being good or bad in a subject. Now I think more about what makes the teacher good or bad or makes me perform good or bad in class. I now know there is more to it – including how teachers and students feel about one another, about the subject, and how and what they do in a class – like their actions. Thinking and talking about this stuff makes it clear that teachers and students are not just good or bad at a subject – there are things we could look at, maybe do a different way, so we could improve it (Danny, electronic correspondence, March, 2003).

Danny asserts it is not enough to acknowledge the difficulties students and teachers face, but suggests that by critically examining interactions within the context of the larger structure that alternative solutions can be generated. Danny is suggesting that teachers and students conduct an investigation to research their difficulties in an effort to change and improve the teaching and learning opportunities for all.

In our own research, video and audio analysis added a layer of complexity to the process of reflection that is often lacking in action-research as commonly practiced by teacher-researchers. By capturing classroom interactions on video or audio, teachers and students have access to a record of the classroom that is not subject to the reconstruction of a moment based on individual or collective “memories of events.” Analysis of captured events in conjunction with autobiographical reflection provides teachers and students with a resource to engage in a structured examination of our individual practices and interactions within the context of lived experiences. In this way, my students and I individually and collectively challenged the beliefs we held about science and science education, and the way we viewed our relationships with one another both in and out of the chemistry classroom. Thus, this process of structured reflection and collaborative research provided a pathway for change as my students and I examined the ways we enacted culture in our classroom and how this afforded and/or truncated our ability to teach and learn chemistry.

9.4.3 The Importance of Capital Exchange in Diminishing the Role of Other

This research asserts that schema, practices, and resources are held within a dialectical relationship with structures that are dynamic and, as such, are shaped by the practices and schema of individuals within those structures. The structures that shaped the interactions between my students and me were both socially and historically constructed and were mediated by a variety of factors, including the types of capital we each brought to the classroom and the schema we held concerning science, the construction of knowledge, and one another. In this research, overlapping fields of cogenerative dialogue provided the pathway necessary for my students and me to gain a critical understanding of the structures that shaped our practices in the classroom by enabling us to examine and recognize both our differences and similarities. These conversations allowed students, who were typically classified as “Others,” a space to voice their perspectives concerning the classroom and their experiences in it.

These overlapping conversations enabled students to form new social networks and to gain social and symbolic capital with one another when their suggestions brought about major changes in classroom structures. This process was also important because it provided some students with the power to alter classroom structures that did not support their learning. Although offered as a limitation of the transformative potential of cogenerative dialogues in an earlier section of this chapter, issues surrounding whose voices were privileged in these conversations provided an interesting contradiction. As a result of the inequitable distribution of power that occurred in the classroom at different times during the year, high-achieving students like Mark and Yanque found themselves positioned as “Others” in the science classroom for the first time in their school careers. This outcome could be viewed by some as a negative experience, but both Mark and Yanque were afforded a powerful learning opportunity by this reversal of fortune from which they both agree they learned to understand “what it’s like to be a student who struggles in class.” Yanque stated she “learned what it was like for other students who did not do well in science and how it might feel to not be the top student. It did not feel so great.” Mark said he felt he better “understands why some kids may not act like they want to be in a class or even try their hardest because they are discouraged or unhappy about the whole

situation. I never really understood why someone could fail before now. Maybe some kids do not do well for other reasons besides not trying.”

Our participation in multiple, overlapping fields of cogenerative dialogue allowed us to explore our interactions with one another in the classroom (and in other social spaces) to the extent that these conversations became a resource for the development of our community of learners. That some students had the agency to access this resource more than others required us to constantly reevaluate our interactions and continually renegotiate roles as classroom structures and participant practices continued to change. The dispositions we each gained from our experiences in differing fields of cogenerative dialogue were crucial in that they provided a structure for renegotiating our roles both in and out of the classroom. Through their experiences as researchers and their participation in cogenerative dialogues, students became more practiced in analyzing classroom interactions and more skilled at voicing their ideas and opinions in a responsible and constructive manner. In addition to my being more receptive to their suggestions for changes to my teaching practices, the dispositions students gained by being with and talking to adults enabled me to see them as capable of taking a more active role in the classroom and in their own learning. By implementing student suggestions for change, I built social and symbolic capital that resulted in positive classroom interactions and increased positive emotional energy with me and with science. This increased capital enabled me to interact with students in different ways than I had in previous years. As the quantity and quality of my interactions with students increased, I had greater opportunities to recognize and understand the capital individual students brought to the classroom. This, in turn, enabled me to use their capital as a resource for my teaching and their learning.

Increased student-teacher interactions play a crucial role in being able to “bring students to science.” This is because these experiences enable teachers and their students to restructure the classroom to create resonant conditions so that each participant can enact the culture he or she brings to the classroom. Through collective reflection on individual teacher and student practices and beliefs (using multiple data resources including video vignettes and audio transcripts), we were able to examine the cultural differences that stood between us. By identifying the

different needs, strengths, and weaknesses of individuals, we were able to suggest alternative structures to support our collective goal to learn chemistry. Our experiences in overlapping fields, such as student cogenerative dialogues with Sarah-Kate and my in-class huddles with students, provided us all with multiple opportunities to discuss difficult issues over time. This allowed us to individually reconsider our beliefs with input from multiple perspectives. This was important for two reasons: these discussions allowed us to encounter ideas from differing perspectives over time while simultaneously providing us with multiple instances to re-construct and “try out” our evolving understandings with others. As we continued to engage in conversations with others over time, our collective understandings became a resource for other conversations, thus creating a spiral of connected ideas across fields. In this way, our experiences in cogenerative dialogue facilitated a level of awareness that was necessary for us to reflect collectively on our interactions for the purpose of making and sustaining change in classroom structures and, hence, participant agency.

Specifically, cogenerative dialogues enabled me to meet my goal of teaching chemistry to a diverse group of students by allowing me multiple opportunities to learn about the lives of my students. Alternatively, these conversations provided a means for me to receive feedback concerning my own changing teaching practices. Based on our research findings and our collective understanding of what constituted good teaching, I attempted to create resonances for student dispositions that facilitated their learning by teaching in ways that were more adaptive to their practices. Students cited my increased use of student groups, drawing diagrams on the board, making analogies to the real world, and use of everyday language to describe concepts as changes in my teaching practices that addressed their dispositional need to “experience science in the everyday.”

Participation in these conversations enabled students to take greater responsibility for their learning by providing them with the tools they needed to examine the ways in which their individual practices afforded and/or truncated their ability to learn chemistry. Some examples include students who altered their study habits by developing a schedule to organize and manage their time, students who recognized that to be productive in class they needed to sit (or not sit) with their friends, and

students who learned that they needed to ask for more assistance from me, their peers, and tutors both in class and after school. Through structured self-reflection, in conjunction with cogenerative dialogues and data analysis, some students were able to provide me with suggestions to alter my teaching practices in ways that created classroom structures that better resonated with their individual learning needs. Chandra states, “I never really looked at both sides of the equation before, I just thought teacher = teaching, but now I also see student = learning. Putting them both together balances the equation because we both play an equal role.” In the same respect, I found I had developed a better understanding of the relationship between my teaching and my classroom with relation to other teachers and the school at large. I was starting to see the role I played as part of a larger fabric of the school and the ways in which my actions in the school were shaped by others. In this way, overlapping cogenerative dialogue supported the notion of shared responsibility for change because my students and I were recognizing 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.

9.4.4 Creating Collaborative Learning Environments via Collective Responsibility

Cogenerative dialogues enabled us to challenge individually and collectively the notion of what it means to *do science*, thereby enabling many students who were previously marginalized in science classes to become more fluent in their production and reproduction of our newly cogenerated conception of “science culture.” My changing beliefs afforded me new teaching practices as I began to focus less on the traditional schema related to science, placing less emphasis on the memorization of rules and facts, and greater emphasis on providing students with increased access to activities that developed their science understanding. In addition, I engaged in discussions more frequently with other teachers and students about science and science teaching. These conversations allowed me to recognize that through the doing of science students can learn new schema. These changes allowed students increased opportunities for developing dispositions leading to increased science fluency. Before my experiences with cogenerative dialogues and this research, I did not recognize the relationship between the schema and practices of science and as a result, I was unable to help students make connections between the two.

The cogenerated outcomes of these discussions provided us with new structures that, in turn, became resources for my teaching and for their learning. Collins (2004) asserts that an individual's emotions are recursively tied to his or her practices, thus the solidarity and positive feelings generated by being involved in activities that were suggested by students in cogenerative dialogues afforded us with more resources for developing dispositions *in* and positive associations *with* science (Tobin, in press). As these new practices became a part of the dynamic classroom structure, they became a resource for others, thus changing the structure of the classroom yet again. This set up a continual cycle of critical reflection and adaptation in which my students and I enacted different practices and then reflected on these changes in an effort to produce new cultural practices that altered the agentic possibilities for everyone in the classroom. This process enabled us to confront and alter practices and beliefs that truncated teacher and student agency, positioning us as agents of change in the classroom to the extent that school and classroom structures allowed.

9.5 AUTHENTICITY CRITERIA

Consistent with the methodological framework that guided and supported this research, in this section I employ Guba and Lincoln's (1989) fourth generation evaluation criteria to evaluate the trustworthiness and authenticity of this study. Each of these criteria, including ontological, educative, catalytic, and tactical authenticity, has been addressed to different degrees throughout the dissertation. The analytical depth and scope of this study made possible by the prolonged engagement with and persistent observations of participants lends to this study's trustworthiness. Credibility was established via peer debriefing and member checking. In this study, member checking served a crucial role in determining credibility by "establishing the multiple realities" of differing stakeholders and by "verifying those multiple constructions with those who provided them" (Guba & Lincoln, 1989, p. 239). Cogenerative dialogue (LaVan, 2004; LaVan & Beers, in press; Roth & Tobin, 2002; Wassel, 2004) provided a powerful forum for this member-checking process in which the interpretations of multiple stakeholders were continuously co-constructed and revised. The collaborative nature of this research lends to the ontological authenticity of the study in that multiple voices and perspectives informed and

altered the direction of the research, providing another layer of complexity in the development of this research/theory/practice model of investigation.

In an effort to meet both the educative and catalytic criteria, the study was designed to be flexible and, as such, was recursively informed by the findings of our collaborative research team (including Sarah-Kate, student researchers, DUS researchers, and me). This allowed us a means by which to identify, address, and transform oppressive structures as needed, over time. Student receptiveness to cogenerative dialogues and their willingness to participate in this research in order to restructure the classroom demonstrates how this research afforded student agency via their participation in these activities. The extent to which students actually benefited from their participation in the research varied depending upon the individual student. The following is a quote taken from Chandra's electronic journal in which she was asked to reflect upon her role as a student researcher and in what ways she felt she personally benefited from her experience:

I think working with the research group helped me immensely over the course of the year. Through the research group I was able to sit down and talk with Sarah-Kate and Ms. Martin about how she [Ms. Martin] thinks and feels. It helped me to understand the workings of her mind and to clarify some of the problems I have had with her. I've learned a lot through Ms. Martin and the way she teaches. I've also learned a lot about my classmates and a lot through my classmates. The thing I will miss the most is the friendship I not only found in my classmates, but in you [Ms. Martin]. You never talked down to us as students and you talked to us like you were on the same level. You also acted like you wanted to be here, not like you were forced to (and we all know you don't teach for the money!). About myself, I have learned that I am a pretty smart girl and that all I have to do to learn is to take it to a level where I can comprehend and have fun. Finally, I learned that sitting next to my friends in class will not distract me because they can be a resource for my learning (Chandra, Personal reflections on being a researcher, November 2002).

During a cogenerative dialogue with Chandra a year and a half after she wrote this reflection, Chandra stated that many of her teachers and peers are "shocked that I did not get killed or pregnant by now and drop out of school." Admitting that even she is surprised by her accomplishments, she attributes some of her success in school to the time she has spent as a participant in this study. Chandra notes that she has a better understanding of "how to approach my teachers with problems" and how to "resolve issues with my friends and my mom by listening to their perspectives and

getting them to listen to mine.” I asked eight students, whom I followed from our class two years previously, to reflect on the significance of their participation in this study. The students unanimously reported that what was most salient about the experience was what they found out about themselves and their peers as learners and that they learned that teachers are “just people too.” They reported that the actual chemistry content was secondary to what they discovered about how to better support their own learning and that of their peers. In addition, they felt they had a greater appreciation for their responsibility to the overall learning environment and the importance of their role as the student in the teaching and learning equation. Thus, for some students, their participation in this research resulted in expanded agency as these students have learned to identify and use structures and resources to meet their goals and have even expanded their goals and expectations for themselves.

Evidence of this agency can be seen in their understanding of what it means to become responsible for their own learning and that of their peers. Lacking the support of their science teacher in their junior year, students organized themselves into independent study groups and gathered as a class (without their teacher) to engage in explicit conversations about how to improve their learning environment. Several students attempted to implement strategies they learned in chemistry class the previous year, to engage their new physics teacher in a cogenerative dialogue about the classroom. In an electronic correspondence describing the event, Mark wrote that he and his entire class held a meeting to discuss how best to approach their teacher in which they discussed the importance of asking him to meet at his convenience, to present specific questions and concerns, and to try and do so with as much respect as possible. When their attempts to engage this teacher in a discussion about class failed, they approached other adults in the school and asked for someone to facilitate the discussion for them. Unfortunately, this too failed.

Previously discussed as a limitation to this study, that my students had little experience approaching adults to request cogenerative dialogues to discuss classroom structures, these students lacked this experience as a resource from which to draw upon. As a result, they were unable to convince the new Physics teacher to engage in any class discussion at all and some felt they only succeeded in “alienating him even more.” Students reported they were unable to explain effectively to the

teacher what the process entailed other than “talking about the problems we are having in class as a group and thinking of solutions.” Their teacher may have been more willing to participate in a class discussion if he had understood more about what my students and I had achieved in our class. However, it is easy to imagine the difficulties this new Physics teacher faced at Urban Magnet and how intimidating it might have been to have an entire class asking to “talk about what is going wrong.” This vignette speaks to the importance of participant “buy in” in the whole process of transformation that is supported by the process of collaborative research and reflection discussed earlier in this chapter. Again, simply reflecting and discussing problems in the classroom does not provide participants with a means to make change.

It is significant to report here that student agency was not truncated in this interaction. Although disheartened by the experience, these students continued to meet outside of class, forming independent study groups in which they “taught” one another the physics material they did not understand from class. Even though the personal interactions between the students and their teacher did not greatly improve during the year, these students organized to support their own learning – taking responsibility for both the individual and the collective learning of all of the students in their classroom. Students relied on the social networks they had developed within and around science learning from their chemistry class and used them as a resource for the learning in their physics classes. In addition, even though a majority of the students from my chemistry class reported that their experiences in science during their junior year left them with a negative feeling towards their teacher and the class as a whole, it did not leave them with a negative feeling towards physics or science in general. Many reported they looked forward to having the opportunity to “tackle physics again in college.” Students were able to see that their negative experiences in these classes did not necessarily reflect upon their abilities to learn and that some of their difficulty was due to their teacher’s inability to teach them effectively. Students were cognizant of the structures that limited this teacher’s inability to interact positively with them even when he was unable to recognize them himself. As a result, they organized to become more responsible for their own learning – addressing issues of structure they felt they could control.

This is perhaps where the real power for transformative potential lies: being able to identify the elements of structures that can be changed, even when agency is limited. In my final meeting with Mark and several other student-researchers in which we discussed their last two years in science at Urban Magnet, Mark ended the meeting by saying “these past two years, we’ve had to bring ourselves to science, to learn it for ourselves because our teachers did not inspire us to learn it with them. But we learned how to do that in chemistry class, we learned to learn science, to do science for ourselves.” Essentially, these students were able to access resources they gained by being with others to make science accessible to themselves even when their teacher failed to do so.

9.6 IMPLICATIONS

9.6.1 Policy and Curriculum

In previous years, researchers and educators have grappled with issues ranging from how to engage in hands-on, inquiry teaching to developing culturally relevant curricula. At the forefront of these discussions has been the drive to develop an educational policy that promotes “science for all” in an effort to develop scientific literacy among all Americans (American Association for the Advancement of Science [AAAS], 1989, 1993; and National Research Council [NRC], 1996). Barton (1998) explored the implications of this policy in her landmark paper *Reframing “Science for All” through the politics of poverty*. The following is an excerpt from this paper:

The very idea of creating science for all is open and egalitarian, and it invites a reflexive relationship between science and all. It invites an examination of how science – and the teaching and learning of science – can be constructed in schools in ways that demand attention to the social, historical, political, and physical contexts of the lives of teachers and students (Barton, 1998a, 1998b; Brickhouse, 1994; Cobern, 1996; Roth & McGinn, 1998). (p. 526).

Emerging from this study is a model of science teaching and learning that attempts to facilitate this relationship between “science and all” by paying particular attention to the development of the relationship between the teacher, the students, and science. Our experiences in collaborative research, cogenerative dialogues, and structured critical reflection enabled my students and me to move towards this ideal as we individually considered our roles in the teaching and learning process. The

dispositions we gained as participants in this research provided us with new resources from which we could examine our relationship with science – including our beliefs about science in the context of our lives. Barton (1998) states that a goal of “science for all” involves the “articulation of values and beliefs about how and why scientific knowledge is created and validated as well as how the learning and doing of science influences those beliefs and values” (p. 539). Discourse between teachers and students around science and science education, as it is described above, is difficult to achieve in today’s school climate in which policies mandating “teacher accountability measures” necessitate that teachers and their students spend an inordinate amount of time preparing for standardized tests.

Already set into motion in the spring of 2002, the policies set into place by the No Child Left Behind (NCLB) Act have swung the pendulum to the far end of the spectrum – moving away from the “science for all” reform movement as envisioned by Barton. In a 2002 press conference, President George W. Bush described NCLB policies as constituting an

emphatic dismissal of the inevitable intrusiveness of the social context of schooling. Much the same is true of students’ socially ascribed traits. If context and social ascription interfere with student achievement, it is because schools are dysfunctional. Otherwise, these extraneous intrusions would be deflected by proper procedures, best practices, and effective school organization (cf. Bush, 2002).

President Bush’s speech, contrary to numerous research findings from prominent educational researchers (Delpit, 1995; Ladson-Billings, 1994; Nieto, 1999), discounts any connection between student achievement and teacher/student past historical, social, and cultural experiences and differences. As such, the programs supported by the NCLB initiative do little to address these issues. In their crusade to hold teachers and students accountable for higher standards in education, state and federal governments have imposed increasingly rigid definitions for what it means to be educated without taking into account myriad factors that mediate teaching and learning (Bracey, 2004; Winerip, 2003a, 2003b). This rigid definition of education provides little space for the implementation of more inclusive pluralistic curriculum movements as the call for higher standards has translated into a need for a standard, national curriculum. Such a curriculum cannot possibly meet the needs of the diverse student population served by this nation’s educational system.

While speaking at a recent conference as a member of a panel entitled, “*The consequences of No Child Left Behind in the larger political, economic, and social context*,” Dr. Sonya Nieto (2004) addressed this concern in her speech:

...a cursory glance of gains on state test scores across the nation suggests that this program has indeed been effective in providing schools with a boost in achievement. However, a closer look reveals some disturbing trends. In the state of Massachusetts, test scores have risen not because student performance is improving, but because fewer students are taking the exams. This is because the greatest gains by minority students in Massachusetts are seen in the school dropout rates, which have increased significantly since the implementation of NCLB. In fact, students are leaving school earlier than before – dropping out in middle school before their ninth grade year (October, 2004).

Thus it would seem that the one-size-fits-all policy supported by NCLB measures has had dire consequences for students of color and those living in poverty – effectively leaving behind the very students the program is supposed to help. This policy shift towards standardized instruction and assessment is in direct opposition to the findings of this research and many other studies involving ways to improve teaching and learning in culturally diverse settings.

If as a nation we are serious about providing all students with equal access to educational opportunities, we cannot continue to ignore the cultural differences that separate students from their teachers and from school. The findings of this dissertation argue for the importance of examining how historically, socially, and culturally constituted factors get negotiated within school structures between students and teachers in order to expose and resolve oppressive and hegemonic practices that support cycles of social reproduction. This research asks educators to focus on bridging the gap between students and their teachers through the use of collaborative, reflective research, and cogenerative dialogue in an attempt to appreciate and understand differences rather than ignore them.

9.6.2 Administrators, Educators, and Students

This study suggests a critical point of consideration for administrators and teachers as they evaluate the role of structure and agency within the school and the classroom. Both administrators and teachers need to be aware of the ways in which structures shape the learning environment. In particular, administrators and teachers need to pay attention to the ways in which structures afford practices and possibilities for

positive associations with science for students. With better administrative support, teachers could navigate school structures with greater ease, allowing them to provide greater support for student learning in their own classrooms. This study provides both administrators and teachers with a means to examine access to and appropriation of resources within both the school and the classroom. And cogenerative dialogues offer a means to identify and evaluate the structures associated with these resources. The transformative potential of this research would have been greater for students in this study had more teachers and administrators been involved in this process.

Historically administrators have been positioned in opposition to teacher and student efforts to alter schools. As such, efforts at school reform on the local level often meet with defeat as administrators, teachers, parents, and students have limited means by which to address their differences. One suggestion for facilitating the collaborative effort required to enable administrators to identify and meet the needs of those served by the school is for administrators to engage in cogenerative dialogues with teachers, staff, parents, and students in an effort to catalyze change that extends the agency of all participants. Cogenerative dialogue can provide administrators and school members with a tool by which they can engage in discussions where they critically examine school structures and participant practices in order to collectively affect change to afford greater participant agency. This research asserts that while dialogues at this level are not required for teachers and students to be able to make changes in individual classrooms, the extent to which they can sustain these changes is shaped by the greater structures of the school, and as such, are necessary.

This means that administrators must work with teachers and students to resolve collectively the contradictions within the school structure that prevent teachers, and students, (and ultimately the administrators) from meeting their educational goals. This should include providing teachers with time to engage in dialogues with their peers and their students about classroom instruction, curriculum development, and interpersonal interactions both in and out of the classroom. Schools must provide teachers and their students with more opportunities to engage in experiences that fall outside the range of traditional classroom activities so that they can interact with one another in ways that foster relationships that bridge the distance that divides students

and teachers and even students and their peers. By implementing structural changes in the school rosters to increase teacher/student social contact time and by providing events that bring teachers, students, and parents together in a variety of social settings, administrators offer their students and teachers opportunities needed to engage in activities that help diminish the cultural differences that lead to incongruence in the classroom. Administrators can play an important role in “bringing teachers to students,” which is a crucial step in helping bridge the gap that separates teachers and students (and administrators) from their individual and collective goals of successful teaching and learning.

9.6.3 Teacher Education and Professional Development

This study has highlighted several critical dilemmas that teacher education programs face today. Over the last decade, researchers have been espousing the need for teachers to become more culturally sensitive to their students. However, as this study has shown, being aware of differences does not translate into successfully teaching across these differences. This research suggests the need for pre-service and practicing teachers to become aware of the beliefs that they hold regarding their students, science, and science teaching through the use of critical structured reflection, collaborative research, and cogenerative dialogues. Participation in these activities provide teachers with opportunities to identify practices that can be unconsciously enacted as habitus due to structural resonances that afford their dispositions to act in particular ways. This study demonstrates that by “being in” particular structural environments “with students” enables teachers to build dispositions and practices that enable them to interact with their students in more positive ways.

Videotape provides an effective means for teachers to reflect on their teaching practices and cogenerative dialogue enables teachers to consider their practices with others. Video analysis of classroom interactions informs teachers of perspectives from multiple participants which is useful in helping teachers recognize the ways in which their unconscious practices structure the classroom. Video also provides teachers with opportunities to examine their practices and identify schemas with others in a safe environment, removed from the classroom. Cogenerative dialogue complements this process by providing a structure in which conversations focus on

changing practices and structures with the support of others. This research provides teachers with real tools (cogenerative dialogue, collaborative research, video analysis, critical ethnography, and autobiography) for affecting change in their teaching and in their classrooms. Teachers are advised to implement these tools in their classroom teaching to address salient issues with their students while simultaneously providing a structured approach to identifying and resolving contradictions. By doing so, students and teachers can become agents of change in their classroom, in their schools, and in their communities.

9.6.4 Implications for Future Research

The findings of this research have important implications for future studies of teaching and learning in science education. Specifically, I have found that finding ways to alter the experiences of future science educators in their tertiary science classrooms is a crucial step in re-tooling teacher-held beliefs regarding science and science education. These beliefs are instrumental in shaping teacher practices in high school science classrooms that serve to discourage students who do not “come to know science” in the same way as their science teachers. Introducing cogenerative dialogues in tertiary science classes, then, has far-reaching implications for how students in elementary and secondary science classrooms may experience science, and thus, introduce their own students to science.

My experiences as a program evaluator in the Master’s of Chemistry Education (MCE) program enabled me to introduce cogenerative dialogues in conjunction with videotape analysis of classroom interactions into one of the chemistry courses in the program. As a result, Dr. Roberts (introduced in chapter 3) has been engaging in cogenerative dialogues with the teachers in his organic chemistry courses for over a year now. Doctor Roberts and his students have discussed a variety of issues, including the effectiveness of his teaching practices, teacher experiences as learners in his class and the program, reasons for student attrition, and the idea of collective responsibility for the learning of all teachers in the classroom. As a result of their experiences in cogenerative dialogues, Dr. Roberts and his students have implemented many changes that Dr. Roberts admits “I never considered necessary before, let alone possible!” Teachers have commented that they have never experienced science in this way and several have started introducing cogenerative

dialogues in their own classrooms based on their positive experiences with Dr. Roberts and their peers.

The benefits of introducing cogenerative dialogue, collaborative research, and critical structured reflection into the science courses at the tertiary level are two-fold: the experiences are changing not only the way future science educators are experiencing science, but are changing the way science instructors at the tertiary level are viewing their own teaching practices and interactions with their students. This has radical implications for the students of these future science teachers and for the students of the science instructors in their other, more traditional, university science courses. By providing university science instructors a means with which to reflect upon their beliefs regarding science and ways of knowing science, greater opportunities exist for self-evaluation of their teaching practices – practices that are shaped by the beliefs these instructors hold about what it means to *know* and *do science*. Using video analysis and cogenerative dialogues, university science learning environments can be transformed, creating classrooms that are more inclusive of students who come to know science in ways that lie outside of what has been traditionally accepted and valued. This addresses one of the concerns I had about what sort of experiences my students would have in college science courses and whether my class prepared them for what they would face at the tertiary level. This research has the potential to reform science education at all levels, making science learning more accessible for all students. Given a structure that enables participants to engage in interactions with one another in ways that expands teacher and student roles and agency provides a pathway for making “science for all” a reality for all regardless of their individual differences.

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APPENDIX

Transcription Conventions

↑	Rising intonation
↓	Falling intonation
—	(underline) stress
(1.0)	silences, time to the nearest second
[simultaneous talk by two speakers, with one utterance represented on top of the other in the moment of overlap marked by left brackets
,	pause or breath without marked intonation and laughter breaking into words without speaking
=	Interruptions or next utterance following immediately, or continuous talk represented on separate lines because of the need to represent overlapping comment on intervening line
[...]	Transcriber's comments