

BEING, BECOMING, AND BELONGING: IMPROVING SCIENCE
FLUENCY DURING LABORATORY ACTIVITIES IN URBAN EDUCATION

by

Wesley Pitts

A dissertation submitted to the Graduate Center Faculty in Urban Education in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York

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07-27-2007

Date

Kenneth Tobin

Chair of Examining Committee

07-30-2007

Date

Philip M. Anderson

Executive Officer

Susan Kirch

Sonya Martin

Supervisory Committee

ABSTRACT**BEING, BECOMING, AND BELONGING: IMPROVING SCIENCE
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By

Wesley Pitts

Advisor: Professor Kenneth Tobin

The research presented in this dissertation uses authentic ethnography, augmented by video and conversational analysis, to investigate the teaching and learning of chemistry across boundaries of difference in an urban high school. A coordinated set of theoretical lenses from cultural sociology and sociology of emotion is used to deploy and analyze these methods. All four students highlighted in this study are Black and/or Latino females from working class income families. They identify as second-generation Americans either of African American or Caribbean heritage or Latina of Latin American or Caribbean heritage. The students achieved mild to moderate success in a tenth-grade level chemistry class. Their chemistry teacher is a first-generation immigrant middle-aged male who would ethnically be considered Filipino-American. The focal fields of this research occur in Regents chemistry laboratory classes in a small secondary inner city high school in the Bronx, New York City, and associated cogenerative dialogues.

One of the major premises of this study is that learning is a form of cultural enactment (i.e., production, reproduction, and transformation). Culture (schema and practices) enacted by students and teachers in one field can be enacted successfully in

another field because fields are surrounded by porous boundaries. Accordingly, participants use resources to meet their goals (e.g., learn chemistry), in so doing, create interstitial culture that becomes part of the structure of the field and resources for learning. A priority was to examine how learning and teaching of science is enacted when students and their teachers are able to coparticipate in culturally adaptive ways and use their capital successfully.

A key implication is the need for teachers and students to be aware of cultural encounters that afford positive emotional energy and solidarity. The important point here is to minimize encounters that create negative emotional energy. What we learned from observing successful student-student and student-teacher encounters is that creating structures and agency that support positive emotional energy and solidarity is a necessary ingredient towards the emergence of fluency in science. Creating and appropriating interstitial cultural resources that support success in science is a path to engaging in more canonical ways of doing science.

Dedicated to:

My wife, my children, my family, my colleagues, and the rest our community

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CHAPTER 1

Introduction

Don't Flinch From It

Several years ago, I ran into one of my former teachers from junior high school at the City College of New York in Harlem. He was coming out of a class and I had just finished with my math courses for the day. I remember him because he was one of the few black male teachers I have had in the many years I have been going to school. If I think back, I can recall having only four teachers of color. I have spent my entire life being educated in the public schools of New York City (NYC) from first grade to the impending completion of my doctorate. I am a product of the urban inner city environment of central Brooklyn. What struck me the most about that encounter was that I went up to him and said, " Mr. Manigault do you remember me you were my music teacher at Ditmas Junior High School in Brooklyn." He was very polite and indicated he did not remember me, after all it was about fifteen years ago. What he did say was that he was surprised that any one of us made it into college and was happy to see that I was doing well. In this case, us meant the class that had most Black students, particularly males of color, were placed in from grade-to-grade in Ditmas. The classes were one notch above special education. Reflecting back, I was happy that Mr. Manigault did not make that statement to us those many years ago; however, others did. It was not until years later, while speaking to a childhood school friend, that I realized how relatively poorly we were treated and racialized in a public school that was lauded as one of the best junior high schools in Brooklyn. The junior high school that my parents, family, and pastor lied and begged to get me into. Of course, it was two junior high schools in one. It contained,

as many schools did, as unofficial "small learning communities" at a time when the term was not fashionable. The school was in an affluent middle class neighborhood where most of the residents were White. It was not my officially zoned school. Reminiscing can be painful but it can also be liberating. Particularly if you do not flinch from your past, it can bring you to understand how you have come to be and how you come to occupy a space where others, even some close friends and relatives may not associate you with.

There is too much and too little to say about those days in junior high schools. The true lessons were often learned in the playground, on the street, and in family gatherings, as well as encounters in the classroom. There you saw the application of experience to life along with the opportunities to build sensibilities that you could not forge anywhere else. The vignette featured above points to the manner in which encounters associated with school can create resonance structures, e.g., meeting a prior teacher or schoolmate, imbued with emotional energy even after many years have passed. These structures often become reified and present themselves after being activated with emotional energy. In hind site many aspects of my encounters associated with schooling were and continue to be imbued with emotional energy. However, this dissertation is not about those days I spent in junior high school. It is about being and becoming fluent in the teaching and learning of science, while creating affiliations across social boundaries that become salient in urban schools.

Dialectical Relationships

At this point an initial exploration of the various uses of dialectical relationships is warranted. The framework in this dissertation contains several dialectically related

constructs. These relationships provide productive ways to think about the unfolding of social life. For example, sameness and difference are brought into a dialectical relationship as copresent to characterize the context of simultaneously experiencing more than one social location in time and space. That is, the experiences of sameness and difference coexist. For instance, a first year high school student can experience sameness by being in a class with other high school freshmen while being the tallest in the class. Other dialectical relationships can be viewed as presupposing each other, such as interactions and transactions. Without interactions, transaction cannot exist and vice versa. Interaction and transaction coexist and presuppose each other. Consequently, constructs brought into dialectical relationships can be theorized using more than one dialectical relationship. The dialectical relationship between interactions and transaction is used to define an encounter.

Incorporated in constructs brought into a dialectical relationship are modes that cohere (thinly) embedded with modes of inherent contradictions. As such, a dialectical relationship can be represented as a recursive relationship where there is a back and forth flow between construct A and B (Tobin, 2007). For example, as culture gets produced (reproduced and transformed) there are patterns that are supported and are enacted while others do not get enacted. It is also possible that neither A nor B is supported or get enacted. In this case there is a contradiction. An example of this is when a particular form of interactions and transactions associated with a field fade or become nonexistent. In the part-whole dialectical relationship, the parts are construed as integral to the whole. For instance, individuals experience social life as both an individual and part of a collective.

The dialectical relationship between individual and collective is constitutive of identity. Throughout the dissertation I use the conventions of the Sheffer stroke to denote pair(s) of dialectical constructs, e.g., production|reproduction|transformation.

Framing Challenges

The United States (U.S.) Census Bureau (2000) estimates that people of color will make up approximately 28 percent of the nation's population and 38 percent by the year 2025. About one million immigrants settle in the US each year, most coming from nation-states in Latin America and Asia. Most settle in large urban centers such as New York City (NYC), Los Angeles, and Chicago because of the perceived potential for greater opportunities in employment, commerce, housing, and education. As such, urban centers provide uniquely diverse settings that serve to bring together long term urban populations with newly arrived immigrants. Yet, urban centers face overcrowding, segregated housing associated with concentrated poverty and ethnicity, and discriminating schooling practices best exemplified by the inequity in school financing based on per pupil allotments (Kozol, 2005). The influence of numerous streams of immigration has produced an increasingly diverse population in urban schools. For example, during the 2004/5 school year, high school students of color made up over 80 percent of the NYC public school population (New York City Department of Education, 2007). Consequently, most teachers in urban classrooms are likely to encounter students from a diverse ethnic, social, language and religious background (Noguera, 2003). In addition, efforts to close the achievement gap between White middle class students and students of color, particularly in the area of science, have also lead to increased implementation of high stakes testing (Rothstein, 2004). Although these testing regiments

are implemented to increase standards, they often create structures that make students opt out of learning additional science. As such, appropriately addressing this set of challenges and others charges science educators to 1) find ways of being and teaching with urban children across difference, 2) move beyond deficit theories of urban youth towards theories of possibilities and respect for a diversity of ways of being, and 3) increase solidarity and enact teaching and learning fluently by avoiding encounters that produce negative emotional energy (Tobin, Elemenky, & Seiler, 2005).

The focus on individualized processes in teaching and learning has gained popularity as deficit perspectives are used to explain social differences and differences in school success and achievement. As boundaries of difference become more fluid and complex through the flux of globalization and immigration, concerns about how to support students and teachers in classrooms with increasing diversity prevail. Teachers and students from diverse backgrounds and social positions bring with them their own ways of viewing their lifeworlds that are reflective of their cultural histories (Tobin, 2006). Learning how to understand and work with students and teachers who have a wide range of experiences, conduct, and beliefs about themselves, and what school means to them helps to better understand classroom encounters. As Gale Seiler (2005) argues, there is enormous potential for urban science education to identify the capital of urban youth and enact curricula in ways that allow them to pursue their interests and use what they know and can do as a foundation for science fluency. Associated with any strategy to address these concerns must include the use of resources to define possibilities in order to accommodate the needs and aspirations of all classroom participants. It is

important to note that the differences that distinguish classroom participants are dialectically present with similarities. Together differences are copresent with associated similarities (see Chapter 2). Even in the context of grouping students of similar age together in a classroom, teachers and students experience a range of differences that exist across classroom participants. Variability that gives rise to domains of individual and collective difference, including the manner in which capital is appropriated, emotional reactions to success and failures, and identity formation, is mediated within the agency|structure and agency|passivity relationships (see Chapter 4 part I). In addition, they mediate the context and characteristics of how resources aggregate and get appropriated in social encounters in the classroom. The major focus of this dissertation is devoted to exploring the social context and characteristics of encounters that serve to improve teaching and learning of science, particularly chemistry education.

Learning Science as Cultural Production

In this research teaching and learning are viewed as forms of cultural enactment constituted by a system of schema and dialectically interconnected practices (Sewell, 1999). Individuals experience the culture and other structures, such as time and the capital exchange cycles, associated with a field (see Chapter 4 part I). A fundamental relationship of cultural sociology is the dialectical relationship between agency and structure. Agency requires access to the resources of a field and the capital needed to appropriate them. Although social actors within a field cannot appropriate and enact culture in an identically precise manner, cultural enactment can be aligned to produce (reproduce and transform) successful chains of encounters that meet mutual goals, such

as learning science. As such, teachers and students can "enter" the capital exchange cycle and use their cultural, social, and symbolic capital successfully in chains of encounters to expand their agency to teach and learn science (Bourdieu, 1986). In addition, classroom participants unconsciously and consciously appropriate or are imbued (passivity) with capital. For example students in a classroom can experience passivity with capital garnered from other fields (e.g., trouble maker). As such, fields are surrounded by porous boundaries where culture from one field can be enacted in another field. Individuals enact and experience culture through practices composed of patterns of thin coherence and their associated contradictions across multiple fields. A key implication of this is the production of rituals and interstitial culture in the classroom to improve teaching and learning. Chapter 4 part II explores the ways in which micro successes are produced and mapped into rituals that help to sustain interstitial culture during the teaching and learning of chemistry.

Towards Solidarity and Fluency in Science

Emotions

The sociology of emotions, grounded in the works of Randall Collins (2004) and Jonathan Turner (2002), provides a theoretical framework for understanding encounters. Collins posits that successful encounters are associated with positive emotional energy. This theoretical framework is used to understand the extent to which emotions become associated with synchrony and provide resources to create social networks. Emotions are a central part of maintaining solidarity and understanding student-student and student-teacher classroom encounters. As such, positive emotions support synchronous coparticipation and provide resources to create solidarity and help

build communities of learners. In contrast, indicators of negative emotions, such as fear, frustration, and anger, lead to unsuccessful encounters that help to disrupt rituals and learning opportunities. Chains of encounters are imbued with emotional energy. For chains of encounters to be sustained and successful, there must be a net positive emotional experience throughout the set of encounters.

Solidarity

Solidarity is part of cultural enactment; consequently it is constantly being produced, reproduced, and transformed in a dynamic manner. Solidarity encompasses an affiliation and a sense of belonging together that produces synchrony (coherence in practice) and shared schema among participants in a field. There are collective and individual responsibilities associated with such an affiliation. Salient to the affiliation is a feeling that involves caring for and protecting the other while demonstrating collective responsibility. These responsibilities as well as obligations shape encounters. As such, solidarity requires the acceptance of others' culture that binds the collective together across difference, and is embodied in modes that create synchrony. The evidence for synchrony might include coordinated eye contact, head movement, gestures, prosody, body orientation, overlapping speech, and enactment of rituals. In this manner, humor, smiles, agreements, and sharing forms of micro success build upon each other to create fluent (i.e., timely, appropriate, and anticipatory) encounters (see Chapter 4 part I).

Organizing Framework

The locus of perspectives utilized in this body of work suggests that cultural forms vastly expand possibilities of affiliation and communication that constitute larger

and overlapping cultural spaces. The configurations of social life emerge across a range of cultural formation, such as ethnicity, age, high school student, gender, and urban youth, which produces salient notions of difference elaborated in empirical research presented in this dissertation. As such, the application of practice together with theoretical frameworks constructed in this study guides the deployment of research methods. Empirical research cannot link everything to what educational researchers learn about teaching and learning outcomes, however connecting different types of knowledge together create an array of understanding that can contribute significantly to the field of science education.

This dissertation explores cultural formations in the context of teaching and learning chemistry. A theoretical framework is formulated that produces productive ways to understand complex encounters nested in the micro, meso, macro, and global landscapes associated with the context and participants of this study. I theorize encounters as a dialectical relationship between interaction and associated transaction. This relationship is explored in part I of chapter 4. Throughout the chapters in the dissertation a methodological framework is presented that embraces a multilevel approach that conceptualizes three dialectically connected levels of social life. The micro level involves the encounter of individuals with structural resources as stocks of knowledge at hand are enacted. Agency, the ability to conduct social life, is enacted at the micro level as resources are accessed, appropriated, and reshaped.

The meso level occurs within a single field. Resources such as time and space structure fields. Participants experience culture associated with a field. As such, the meso level occurs within a single field and involves social life as it is normally experienced. The macro level involves participation in more than one field, including schools and other multilevel forms of organization. Fields can be nested within one another and intersect to create more complex organizations. This approach affords zooming in and out across macro, meso, and micro levels, which are dialectically related; that is, each presupposes the other two and are copresent as social life gets enacted. Yet, another set of dialectics exist among the global and macro|meso|micro relationships. Consequently, when they are brought together as referents to think about social life, they help to render an understanding of the complex multidimensional nature of encounters in urban classes. For example, global level structures, such as immigration, together with national education policies are resources that saturate the classroom field at the meso level. Hence, illustrated in the chapters is the necessity to understand encounters and events that extend beyond micro and meso, into the macro and global perspectives.

Inscribed in this organizing framework is a mixed method approach. A coordinated set of theoretical lenses synthesized in this dissertation guides the deployment of research methods including authentic ethnography, cogenerative dialogues, coteaching, and conversational analysis. These methods are used to gather and process multiple types of data sets. This research uses authentic ethnography, augmented by video and conversational analysis technology, to investigate the teaching and learning of science across closely associated social fields. Role-to-role encounters in fields inside

and outside the classroom create structures and agency that support positive emotional energy and solidarity. An important component of this research was to enact coteaching and cogenerative dialogues associated with science classrooms as research methods (Tobin & Roth, 2006). Cogenerative dialogues are organized to create a space to talk about shared teaching and learning experiences. One of the intended outcomes of cogenerative dialogues is that students and teachers (along with other stakeholders) can coconstruct transformative culture and strategies for improving their learning environment and academic success. This often includes coconstructing ways for improving teaching, student attentiveness and participation, attendance, and test scores. Coteaching was used as a teaching and research method that brings one closer to the praxis of another (teacher and student); it is a specific form of coparticipation. This affords the ability to access another's praxis to be able to make assessments and evaluations of other teaching and learning experiences.

Building On the Past and Moving in Future Directions

Important precursors to the work presented in the dissertation is found in work conducted by the team of education researchers led by Kenneth Tobin (Tobin, Elmesky, & Seiler, 2005) in Philadelphia, and more recently in NYC (Tobin & Roth, 2006), and the group lead by Angela Barton (2003) in NYC. Barton's group in NYC explored how homeless urban youth and adults can do science and work together to make personal changes and changes in the community. In their work urban homeless youth used their capital to expand their agency to enact power, resistance, and solidarity to revitalize an abandoned community garden. Barton's group argues that a framework for understanding how urban youth use science in a situated context, their motivation for doing science, and

for wanting to succeed in science must help connect their lives and worldview to science. A potentially successful way to work with urban youth to improve teaching and learning science is to capture the impact and new dimension of resources and understanding they bring to science education research as student researchers. Tobin's group in Philadelphia incorporated student researcher to afford their agency and voices on how to teach science to youth that share similar social spaces (i.e., how to better teach students like me).

The research in Philadelphia encompassed four urban public high school located in residentially segregated neighborhoods. They included a selective magnet school, a charter school, and two comprehensive high schools -one subdivided into small learning communities. Differences in terms of student population and resources, particularly between the admission selective school and neighborhood schools, were explored in the context of teaching and learning science. General findings from this group suggest that positive emotional energy of coparticipating with others, associated with successful encounters, can sustain a sense of group solidarity and create additional positive emotional energy even for aspects of science that might not immediately appeal to students. Additional findings from their work assert a priority to ascertain which forms of encounters lead to the building up of negative emotions in science classrooms so that enacted curricula can avoid them. Although each of the research groups mentioned above comprised related but distinctive lines of study, the research in this dissertation build upon both conceptually in a manner that views: 1) teaching and learning as a form of cultural enactment, 2) creating shared control in the design of science curricula as an essential element to catalyze science fluency and success in the lives of students, and 3)

both students and teachers bring significant and multiple ways of contributing to science and science education that, when these contributions are valued, become seedbeds for enacting culture that increases fluency and solidarity while engaging in teaching and learning of science.

The opportunity to conduct the research that led to the study presented in this dissertation came when I joined Kenneth Tobin's NYC research squad based at the Graduate Center, CUNY. At the time the research squad had been actively studying the implementation of cogenerative dialogues and coteaching as ways to improve teaching and learning science in four distinctly different urban schools in the NYC school district. The schools included a suspension center in Brooklyn, an admission selective high school in Manhattan, a middle school in Queens, and New York High School (NYHS) in the Bronx. I began conducting research at NYHS with Christopher Emdin, a member of the Graduate Center squad and at the time assistant principal of science at NYHS, and Rey Llena a high school chemistry teacher. I began coteaching Regents level chemistry with Rey in his classroom and in a Saturday out-of-school program designed to prepare students for the statewide Chemistry Regents exam. I also participated in cogenerative dialogues initially organized by Rey, Christopher, and student research participants. The main goal of the research efforts was to investigate the coherence of teaching and learning of science as cultural enactment across three distinct but closely associated social fields (e.g., classroom, related cogenerative dialogue, and out-of-school program). In the months that followed my introduction to NYHS I created a research agenda to

explore how the uses of coteaching and cogenerative dialogues can create successful ways to teaching and learning of chemistry.

New York High School and Research Participants

NYHS is located in the Kingsbridge neighborhood of the Bronx. NYHS opened in 2004 replacing a middle school plagued with low standardized exam scores, school violence, and a general reputation for low academic performing school (Emdin, 2007). NYHS is a small learning community themed for nursing, medicine and allied health professions. The school's focus on preparing students for careers in health science came about as a result of the Bronx being designated by the New York State Department of Health and Human Services as a county with a critical shortage in health care professionals, particularly nurses (Calman, 2005). Although students from areas throughout NYC are allowed to attend NYHS, most students selected to attend come from immediately surrounding neighborhoods in the Bronx. Mostly students of color coming from African American, Latino, and African Diaspora backgrounds populate the school. According to the 2004-05 school report card, NYHS student population is made up of 45 percent Black, 51 percent Latino, 3 percent White, and 1 percent Asian and other ethnic groups (cite NYC Department of Ed). Approximately, 84 percent of the students qualify for free lunch.

I situate this study in the chemistry Regents laboratory in NYHS class taught by Rey, a first generation Filipino-American teacher, because he differs from the students by gender, ethnicity, age, and cultural background. Many teachers in urban schools, like

Rey, were scientists who opted to become certified to teach science when he immigrated to the US. The four students presented in this study are all second-generation immigrants and females of color who were completing grade ten at the time of this study. Angel and Disaya identifies as Caribbean-American. Diamond identifies as having Dominican heritage and Amber identifies as having Puerto Rican heritage. Rey identifies as middle class while the students identify as coming from working class households. All four students decided to attend NYHS because of their interest in pursuing a career in health sciences. As the participants in this study experience and interact across differences, they also experience solidarity around teaching and learning science. I chose to spotlight Rey and these four students' encounters in the laboratory classroom because their encounters exemplify how student-student and students-teachers encounters can successfully sustain the teaching and learning of science across differences. Differences in social class, ethnicity, and gender are associated with differences in the manner in which cultural resources get appropriated and enacted by students. As such, salient to this study is to explore the manner in which productive ways of interacting and transacting across difference create success in teaching and learning chemistry.

Making Claims

As noted earlier, micro, meso, and macro levels of analysis can overlap, contradict, or reinforce understanding to create a tapestry of complexity of social life. The research methods utilized in this study draw extensively on all three tiers of analysis to make associated micro, meso, and macro empirical and theoretical claims about the manner in which social life unfolds. Patterns of contradiction and thin coherence identified at the meso level are often explored through micro and macro level analyses to

discern aspects of encounter in science classrooms. Meso level analysis, such as watching video footage at real time speed, participating in cogenerative dialogues, and conducting authentic ethnography, is conducted to help identify major themes while interrogating these meso level data sources. Micro level analysis is used to make sense of what is happening, particularly the appropriation of capital and the production of prosody, that map into meso and macro level claims. Micro analysis entails viewing selected vignettes at varying speeds to interrogate subtle body motions including directional eye gazes, and the use of resources. Macro level claims extend across social space and time. The porosity of field boundaries facilitates the enactment of culture originating from multiple fields. As such, researching teaching and learning of science invite analysis that extends across multiple fields right into global spheres of understanding. The ability to pose questions and make, support, and contradict claims is deeply connected to the agency afforded by research and stakeholders associated with this research.

I investigate two overarching questions in the dissertation. They are as follows:

1) How does interest in science and science education create modes of solidarity in urban environments, such as schools in the Bronx?

2) How do classroom participants enact culture to create structures and interstitial culture that help to improve teaching and learning of science across boundaries of difference?

Authenticity Criteria: Judging The Research

The research in this dissertation infuses a system of quality criteria that can guide the peer review and research evaluation processes. The system of quality criteria must take into account the connection between research method, practice, and theory. I adopt a system of quality criteria for judging interpretive ethnographic research adapted from those developed initially by Egon Guba and Yvonna Lincoln (1989).

The authenticity criteria include ontological, educative, catalytic and tactical authenticities. Ontological authenticity refers to the manner in which stakeholders enhance their own emic constructions of social life as they relate to what they have learned from the study. Educative authenticity represents the extent to which stakeholders, particularly those outside the research group, understand the implications and nuances that emerge from a study. This criterion can be demonstrated by making outcomes of the study publicly available in a responsible manner. Catalytic authenticity relates to the obligation of the research and researchers to define ways to expand the agency and catalyze positive changes of all stakeholders involved in the research. One way to achieve catalytic authenticity is to negotiate and share responsibility for action(s) and follow-ups that foster positive change. Tactical authenticity refers to the extent that stakeholder have enough agency to bring about positive change. As a researcher, I have an obligation to create structures that expand the agency of all participants, such that they can and do benefit from what we have learned from research. This system of criteria should be viewed as a whole and approached in a dynamic fashion that provides implicit and explicit concerns for collective social transformation and agency starting with the

research participants and going beyond immediate stakeholder groups. I use this system of quality criteria to enhance fluency in the process of conducting my research and to help connect practice, research, and theory. I also utilize the authenticity criteria to assure mutual respect for the autonomy of all, beneficence and justice for all human subjects participating in my research as articulated in the Belmont Report (1979).

Chapters in the Dissertation

Chapter 2

The historical analysis presented in chapter 2 is concerned with exploring the interrelationship of changes in the Bronx over time. Embedded in these changes are social, cultural, economic, and material resources that serve to structure agency. Social life, however, does not emerge as exactly the same because it emerges from the dialectical relationship between agency and structure. This dialectical relationship is constantly changing and is salient to the appropriation of capital, including passivity. There is no doubt that social, cultural, and symbolic capital garnered by residents of the Bronx has been captured in historical narratives. Many of these narratives help to sustain deficit modes of thinking as well as modes of resilience associated with residents of the Bronx. The central feature of the historical analysis combines an overview of the process of the formation of the Bronx as an urban center in NYC and its cohesion and fragmentation characterized by hyper-segregation associated with poverty, race, ethnicity, housing, and schooling. This chapter is framed by two key questions: *How did the Bronx become an urban center?* and *What can we learn from narratives of the Bronx?* The periods of cultural transitions co-formulated affiliations and boundaries of

differences in the face of global processes, such as streams of immigration and economic forces. The cultural agglomeration of Bronx neighborhoods as homelands and diasporas are saturated with macroscopic resources, such as ethnicity, economic status, and immigration policies, that structure meso level encounters. The chapter concludes with a discussion of the implications of these macroscopic structural resources in relation to the context of the study presented in this dissertation.

Chapter 3

This chapter is positioned to build on the historical analysis of the Bronx presented in chapter 2. Chapter 3 explores the potential of the Bronx to support teaching and learning of science as a seedbed for science education and the development of science educators. That is, in the streams of multi generational immigration associated with the Bronx and NYC, interest in science and science education creates modes of solidarity across boundaries of difference. These modes of solidarity coexist with modes of difference to produce, reproduce, and transform science education. One of the defining characteristics of this chapter is the use of metalogue in which five science educators linked to NYC discuss and identify issues salient to the domain of science education and science classrooms like those in the Bronx. The polyphonic method embodied in the metalogue reflects the various lenses that the participants foreground to ratchet up the discussion and theorize themes of social encounters associated with science education. Four sections emerged in this chapter to organize the metalogue. The first section explores immigration and the Bronx and its potential to support science education while in the second section the participants discuss ways to achieve shared responsibility in science education. The third section offers narratives of crossing barriers to afford

opportunities and success in science education. The final section discusses tactical and transformative changes sensitive to teaching and learning of science. In the metalogue participants agree, disagree, and challenge viewpoints from other science educators, thereby providing a range of opportunities to engage readers in catalytic and reflective perspectives.

Chapter 4

Chapter 4 is presented in two parts. Part I begins with a consideration for the historical concern about deficit perspectives associated with students of color in urban centers such as the Bronx. This section progresses by building a theoretical framework grounded in the cultural sociology and the sociology of emotion. A mixed method approach is used in which authentic ethnography, cogenerative dialogues, and conversational analysis are deployed to gather and process multiple types of data sets. The methodology used in this paper allows progressively innovative and authentic ways to explore teaching and learning as a form of cultural enactment. The final section in part I, discusses some salient issues associated with the development of NYHS in relation to high stakes testing and the globalized exchange of school organization.

The implications of this methodological framework developed in part I are examined in part II through the presentation of particular encounters in which teachers and students are engaged in teaching and learning of chemistry in NYHS. Part II presents field notes, transcripts, data gathered from associated cogenerative dialogues, and audio-visual records processed using meso- and micro-level analyses to describe and theorize solidarity and fluency during chains of student-student and student-teacher encounters

that occur during a particular phase of a pH laboratory chemistry class. This part focuses on four female students of color and one male coteacher who differ along the lines of ethnicity, gender, roles, and other social markers. All participants are either first- or second-generation immigrants. These markers embedded in encounters present crucial information for participants to communicate, process information, and create success in the doing and learning of chemistry. For example, successful encounters among students and teachers guide the creation of interstitial culture and help to increase fluency and solidarity enacted in teaching and learning in classroom environments. The study presented in this chapter theorizes solidarity as a sense of belonging and affiliation that scaffold encounters during the teaching and learning of science. As such, information, whether embedded in displays of text, gestures, or emotions, plays a critical roles in making individuals aware of their belonging to a group and hence creating and recreating solidarity and identity. Finally, this chapter argues that if solidarity scaffolds successful encounters, emotional energy and resonance structures are the gyroscopes that allow solidarity and fluency to be enacted. In other words, gestures and prosodic markers, such as rate of speech, pitch, and intensity, are interpreted as resources that are co-coordinated with emotional energy and resonance structures to characterize social features of solidarity and fluency. Micro successes, such as matching pitch (fundamental frequency(F0)), successful appropriation of capital to meet goals and motives, power in the air associated with positive emotional energy, map into the rituals that help to sustain and create interstitial culture aligned with success in teaching and learning chemistry. Prosody, gestures, speech content, and emotions are co-coordinated and co-articulated, and present variations in term of how the presentations of solidarity and fluency are

expressed. These markers do not illustrate empirical certainties, but sculpt and display a blend of mutually constituted capacities that can help produce, reproduce, and transform successful teaching and learning of science.

Chapter 5

Implications of this research are far reaching. In this chapter I explore the answers to questions and claims posed in this body of work. As mentioned in chapters 2 and 4 deficit perspectives exist, particularly for students who live and learn and spend most of their time in the Bronx. Those deficit perspectives can give their way into the fiber of the urban classroom. During this study it became evident that students' resilience and strengths were often overlooked in favor of more deficit viewpoints of their abilities and skills. I maintain that creating the conditions to build on culture and shared control in the design of science curricula catalyzes science fluency and success in the life of students. Consequently, education policy makers must revisit old models of accountability as new and more productive lenses emerge to evaluate and assess teaching and learning of science.

CHAPTER 2

Setting the Context of Diversity: How We Arrived Here

Globalization

Derrida: Whether it be the foreigner in general, the immigrant, the exiled, the deported, the stateless or the displaced person (the task being as much to distinguish prudently between these categories as possible), we should ask these new cities of refuge to reorient the politics of the state. We should ask them to transform and reform the modalities of membership by which the city belongs to the state, as in a developing Europe or in international juridical structures still dominated by the inviolable rule of state sovereignty... This should no longer be the ultimate horizon for cities of refuge. Is this possible? (2006, p. 4)

Angel: I agree with immigration. I have nothing against it. If people want to come to NY to have a better life and get better jobs more power to them. Like make a better life for yourself. You shouldn't have to come to a state and people have to tell you that you have to leave because you are not born and raised there. Like everyone should have a chance to do what they want to do and where they want to do it. (Interview Research Participant, March 22, 2007)

The term globalization evokes a variety of meanings that implies the necessity to construct a worldwide contextual level of understanding. In one sense, the term insinuates a global wholeness and unity while in another it suggests a diminishing of social, cultural, and geographical constraints due to an almost instantaneous communication infrastructure, such as satellites, internet, television, and radio, that spans the globe. The notion of globalization, in a general sense, points to the deepening and broadening of human possibilities that are not always recognized. Globalization emerges in several historical formations with a number of different spheres and sociopolitical outcomes. Mike Bottery (2006) expresses six different spheres: environmental, cultural, demographics, economic, political, and American. The processes within each sphere are dynamic and interact externally and internally with each other. Their interactions affect

nation-states, generate policy mediation, and have a direct impact upon educational institutions. Although globalization cannot be confined to these six spheres, they provide a framework to think about globalization. Bottery posits that educators need to be aware of factors beyond their institutions, which constrain, steer, or facilitate their practices. These factors extend beyond the local and national right through to the global. They include not only the forms that help to structure social life on global and national levels (macro level), but the interplay of these forms at the micro level of social life where culture is appropriated. For instance, macro level structures, such as nation-states, boundaries, demography, race, human phenotypes, and immigration are resources for identity production. Identity is partly formed and reformed through agency, the things that people do; however, it is also in a dialectical relationship with passivity. Passivity is the process of being imbued with capital (Roth, Varelas, Hwang, & Tobin, 2007). In other words, one consciously and unconsciously actualizes identities through the simultaneous processes and tensions of agency and passivity. It is also important to understand that both the macro and micro structures saturate the meso level of social life that occurs within a more localized social and cultural formation. I refer to this type of localization where culture gets enacted as a single field. A productive way to think about the connection between globalization and science education is through macro- and microstructures that saturate classroom fields that are incorporated in the formation of science identities and science fluency.

This paper contextualizes how the current ecological situation in the Bronx emerged within the global flux of immigration and other associated structural and cultural

formations. It sets the stage to explore how ecological changes in demographics, housing, and sociocultural relationships emerged and become seedbeds to shape encounters both inside and outside of school, particularly as it relates to science education. The diversity and relationships produced through waves of immigration have added to the matrix of boundaries formed through a continuum of difference and similarities. These relationships are embedded across all levels of social life (micro, meso, and macro) and garner social, symbolic, and cultural capital. It is within the complexity of both the historic and emerging ecological conditions that shape the experiences of individuals as they traverse their lifeworlds.

The Mining of Cultural

Globalization provides access to different beliefs and approaches. Cultural globalization provides a process where different avenues can be accessed to pursue insights into schema and practices (i.e., culture) that give rise to life experiences. It provides the opportunity for individuals to stay in the same location and experience different forms of cultural enactment, such as social ceremonies and music, from almost any part of the globe. As such, cultural production, reproduction, and transformation can be accessed from global and more local levels. Kenneth Tobin (in press) and Christopher Emdin (2007) point out that it is possible to encounter raps songs being chanted in the Bronx, New York City (NYC) that originate in different places around the world such as Philadelphia, Los Angeles, the Caribbean, and West Africa. Youth culture projected in clothing, music, dance, and other forms of body gestures and prosody are disseminated through global youth networks. The tools that help to propel these networks are

accessible to youth, highly mobile, and cross nation-state, religious, and racial, and class boundaries. Although this type of cultural variety may seem desirable, it can easily give rise to the globalization of cultural standardization. In this sphere, standardization operates as a contradiction to the proclivities of a global mining and honoring of the best in cultural differences. Accordingly, cultural standardization operates towards a central tendency of a singular vision of the world. It is influenced by a reformation of cultural bits that can be packaged and guided by the orientations of the global capitalistic market economy accompanied by bureaucratic themes of efficiency, predictability, and control. As in other social spheres, culture appropriated by youth is produced, reproduced, and transformed. This allows the possibilities of organic reinterpretations and hybridization that can give rise to and animate resistance culture. It can also give rise to emergent possibilities for teaching and learning of science. The appropriation of culture through global youth networks allows solidarity across large social landscapes. It also allows social commentaries to be expressed concerning salient local and global issues affecting youth and people in other age demographics.

Globalization has become embodied in particular historical and current worldwide shifts in patterns of migration and immigration. Human migration is the dispersal of human beings across the globe and can be conceptualized in several different ways. It is shaped by both global and more local ecological conditions in time and space. Although migration can refer to long-term patterns of human dispersal across the globe, seasonal and nomadic movement of individuals and populations, I use the term to refer to leaving one's birthplace or place of origin. Human migration is a dynamic process and can be

caused by many ecological conditions. At times migrants move freely from their place of origin to the area of destination while other times movement is coerced and forced. For instance, millions of Africans were forcefully uprooted and brought to the United States and the Americas during the Trans Atlantic Slave Trade (Franklin & Moss, 1994). In 1790, Africans were 19 percent of the population in the United States (Pedraza, 2006). This population of African slaves was concentrated in the southern states. Similarly, the conquest and annexation of Native Americans, Mexican and Puerto Rican territories by the US also caused forced migration. It is estimated that 1,800 Puerto Ricans initially migrated to NYC immediately after the US took possession of the island at the conclusion of the Spanish-American War in 1898 (Badillo, 2004; Wikipedia, 2007, February). This initial migration from Puerto Rico to NY was aided by a 1917 US immigration act that collectively naturalized Puerto Ricans as US citizens.

The highest percentage of the world population migration occurred between 1850 and 1910 (Adams & Kirova, 2007). During that period of time, 10 percent of the world population was on the move. In the late 19th century, millions of eastern European and Asians settled in the United States. In 1890, 86 percent of foreign-born people in the United States came from European countries (Pedraza, 2006). Modern conditions have produced complicated causes and unexpected conditions leading to new migration, living, economic, education, and schooling patterns. Today, warfare across sociopolitical boundaries, scarce food resources, seeking jobs and educational opportunities are still salient issues that impact migration and immigration (Low, 2006). According to the Global Commission on International Migration (2005), there are currently 200 million

people living away from their place of birth. As families with school age children migrate, they must interact with the school systems in their new locations. Reciprocally, the school systems must also learn how to interact with altering cultural spaces created and shared by new and multi-generational immigrant student populations and their families. These global and more local trends continue to have a significant effect on the racial and ethnic compositions of the public schools in NYC, such as New York City High School ¹(NYCHS) in the Bronx. The confluence of these stories and experiences are important to investigate because they provide a window into how the current population of students in NYCHS reflected the more recent changes in the urban ecology of science classrooms in the Bronx, the NYC public school system, and global trends. Encapsulated within these trends and changes is the creation of new cultural fields both inside and outside the classroom. These cultural fields are surrounded by porous boundaries (Tobin, 2005). As such, culture enacted by students and teachers in fields outside the classroom can get enacted in fields inside the classroom, and vice versa. These new cultural fields can afford and restrict identity and expressions of students' ways of knowing and learning science.

The Shifting of Resources

Globalization is partially underwritten by an economic ideology of a worldwide free market society. Attached to the notion of a globalized free market macro schema is the movement of resources, such as jobs and industry, from one nation-state to another. In its ideal free market form, globalization works when new jobs become available to

¹ Pseudonym

replace old and workers can adopt and compete globally according to their talents (Cross, 2006). The economic reality is that the promises of new jobs by corporate and government entities to replace the old are never realized in many places around the world. In fact, globalization has produced a segmented labor market. The slave trade, spear-headed by many European countries, was an infrastructural forerunner of the present global segmented labor market (Cross, 2006). African slaves and their descendants were not able to compete freely for wages and jobs. Today, the legacy of a globalized segmented labor market is realized in the form of racism and defacto segregation that mediate access to resources (Wilson, 1998). Through the institutions of slavery, Jim Crow Laws, and modern forms of racism, African Americans have experienced successive forms of structural and economic oppression. For instance, in a 2000 survey conducted of Black males in NYC it was found that 48 percent of all Black males between the ages of 16-64 were unemployed in New York City (2005). The outcomes from these experiences for African Americans have been a partial level of cultural assimilation with social and institutional segregation. As worldwide resources remain relatively constant, a shifting of resources necessarily means more for some and less for others. What has emerged out of the present globalized front is the marshalling of resources through a zero-sum process. The shifting and absence of resources often lead to immigration, migration, and social stresses, such as less jobs, inadequate housing, and school overcrowding, that affect many public schools located in inner-city urban areas like the Bronx.

The terms migration and immigration are sometimes used interchangeably. I will refer to migration as a more general term describing the movement of people within or across boundaries of nation-states. The creation of sociopolitical boundaries that define nation-states and their associated security concerns gave rise to the notion of immigration and immigrants. Immigration is the movement of individuals or groups of people originating from one nation-state to live, either on permanent or temporary bases, in another nation-state (Adams & Kirova, 2007). I refer to immigrants as people who settle either permanently or temporarily in a nation-state different from their nation-state of origin. I also treat race and ethnicity as two distinct socially constructed concepts. The concept of race refers to distinctions drawn from observable phenotypical characteristics (i.e., appearance). The content of race, such as skin color and facial features, varies according to changing circumstances and global region. For instance, the construction between "Black" and "White" in the US is different in the Caribbean and Brazil where intermediate levels of gradation between Black and White extremes can correspond to varying levels of social status. Ethnicity draws on distinctions based on national origin, language, religion, and other cultural markers. Race and ethnicity are not static concepts and, as identity, mediate between the individual and collective.

Difference

Differences in individuals and social location are an inherent aspect of social life. As individuals experience sameness, they also experience and confront differences. These differences create social and cultural boundaries that arise from cultural enactments that are produced, reproduced, and transformed in a dialectical relationship. The concept of difference is also formative in that it can give rise to a matrix of boundaries formed by

sociocultural and political enactment that create structures across macro, meso, and micro levels of social life. Macro, meso, and micro levels of social life always occur simultaneously and can be conceptually thought of as a triple dialectic (macro|meso|micro)². That is, one cannot analytically think about what occurs on a meso level without concomitantly thinking about macro and micro levels. Global macro structures and schema such as nation-states, nationality, and ethnicity have given rise to the concept of immigration and immigrants. It is the movement of individuals and groups of individuals from one nation-state to another that helps to create differential social, symbolic, and cultural statuses. There is a longstanding immigrant experience of families and individuals who migrate across geographic and global borders, as well as, cultural borders. For instance, people who migrate to the US often get passively inscribed the status of legal or illegal immigrant by macro immigration policies or they are socially othered by national ideology. These policies and ideologies get saturated into meso and micro levels of US society.

The immigrant experience is an experience of difference and sameness. Families and individuals who migrate often experience differences in social status that are characteristic of social structures such as nationality and the right to education. These differences can be viewed from the vantage point of social class, age, race, ethnicity, gender, and national identities that structure interactions. Immigrants can also find sameness by settling in similar cultural enclaves or by seeking out familiar religious organizations or professions in their new host nation-state. A primary example of this is

² The sign " | " separating pairs of terms is called a Sheffer stroke. It denotes a dialectical relationship between terms and their associated contradictions.

the recruitment of immigrant teachers with science and mathematics background into the US. Likewise, students can experience differences in ethnicity and other social markers while simultaneously experiencing being grouped with other students of the same age. Similarly, when students show expressive individualism it can be thought of as a way to express oneself, but also a way to belong to a particular cultural ethos. Viewed from a perspective of difference cultural enactment necessitates that social actors find appropriate ways to work across these social boundaries. As such, difference is in dialectical relationship with sameness. It is this tension along with internal contradictions that create the need to mitigate the experiences of differences, particularly in the teaching and learning of science.

Immigration and the Bronx

First Two Waves

Then came the journey over the sea, and the family with the neighbours' families were part of the life of New York. We were Little Italy...The colony life of the city's immigrant is an attempt to continue the village traditions of the mother country. In our neighborhood, there were hundreds of families that had come from the same part of Italy. On summer nights, they gathered in groups on the sidewalks, the stoops, the court-yard, and talked and sang and dreamed. In winter, the men and boys built Roman arches out of snow.

But gradually the families grew in size. The neighborhood became congested. A few families moved away. Ours was one of them. We began to be a part of the new mass instead of the old. The city with its tremendous machinery, its many demands, its constant calling, calling began to take hold. What had been intimate, quaint, beautiful ceased to appeal. I went to school, father went to work, mother looked after the house. When evening came, instead of sitting about the fire, talking and reliving the day, we sat, each in his own corner. One nursed his tired bones, another prepared his lessons for morrow. The demands of the school devoured me; the work world exhausted my father. The long evenings of close contact with my home people were becoming rare. I was slipping away from my home; home was slipping away from me. (Patri, 1917, p. 4)

Immigration has had a profound impact on the global and schooling experiences in the Bronx. A key factor in creating multi-racial, multi-ethnic, and multi-cultural nation-states is both voluntary and involuntary immigration; however, because of national boundaries immigration as a social category is distinct from ethnic or racial categories, yet, there is very often a great deal of overlap. Immigrants as a social category are distinct because they have experienced life in a different country and cultural setting. They bring these experiences and culture with them that continually helps to shape their ways of being. Angelo Patri (1917), a well known Italian American principal in the Bronx during the early 1900s, describes above that culture that bound immigrant families together often came in conflict with new ways of being and aspirations associated with the new social spaces they occupied.

Global spheres such as economic, politics, and interaction between both sending and receiving nation-states permit immigrants to enter, exit, and exist under varying social and structural conditions. The history of the immigrant population in the US is a primary example of this. The US is a nation-state made up of recent immigrant and multi-generation immigrants (people of foreign born ancestry). To date the history of immigration and migration in the US can be thought of in four major waves (Pedraza, 2006). The first two waves of immigration took place prior to 1930. Over 10 million immigrants arrived in the United States from northwestern European nation-states, such as England, Scotland, France, Ireland, and Germany, between 1830 and 1880. The movement of these immigrants was motivated mainly by political, economic, and religious reasons. During this first wave, there was also involuntary immigration of

approximately 10 million Africans as slaves to the United States. The second wave of immigration occurred between 1820 and 1924 when over 27 million immigrants arrived in the US from southern and eastern European nation-states. This wave of immigrants mainly came from Italy, Greece, Austria-Hungary, and the Soviet Union (mainly Jews). A large population of these immigrants settled in New York. During this time, NYC transformed into a major urban center. The city's population grew from 4.5 million to 7 million at the end of 1930. In particular, the population in the Bronx grew from just under 100,000 people in 1890 to over 1.2 million in 1930. The population of NYC became dense and diverse; however, as select populations increased, they were relegated to certain areas and neighborhoods of the city. The density and diversity were made realities in the crossroads of people in neighborhoods and schools mainly coming from Europe.

The New York City public school system grew at a complementary rate of 21,000 new students per school year during the 1920s. In the Bronx the school registry increased by a total of 60,000 by the end of the 1930s (Rousmaniere, 1997). Part of this trend was due to New York State compulsory schooling laws that required students to attend high school until the age of sixteen. The first public coed high school built in NYC, Mixed High School later called Morris High School, was opened in 1897 in the Morrisania section of the Bronx (Hermalyn, 1995). In subsequent years, hastily built schools were erected to keep up with the demand for space. As these school buildings became run down, they were moved, and combined into new school buildings that housed large numbers of students. For example, Dewitt Clinton opened the same year as Morris High School in lower Manhattan and was eventually relocated. It moved to 59th Street and

Tenth Avenue in Manhattan and then to its present location on Mosholu Parkway South in the Bronx. Large public academic high schools became a part of the NYC infrastructure during this period. Dewitt Clinton became NYC's largest high school. The student body was all male and housed approximately 7,000 students in 1971 (Cuban, 1993). During the same year Morris High School housed approximately 4,000 students. These high schools became too large to manage and, as discussed later, became subdivided into academic houses and small learning communities.

Emerging Neighborhoods and Ethnicities

I came to the Bronx in 1952 as an [German] immigrant myself. I was two years old and I didn't speak any English until I got into Kindergarten...My father worked in Manhattan in the garment center. And we moved because Pelham Parkway was an area that started to build up and all my friends were moving out to Pelham Parkway. We couldn't afford the rent in Pelham Parkway. There was public housing in Pelham Parkway...The third time around applying we got offered this place in Pelham Parkway. A lot of reasons why people moved also was that they built CO-op City and people started to buy apartments there in the middle sixties. So all the apartments became available in the houses that Jewish and Italians had been in. And it became an opportunity for the new immigrants, many immigrants, who were African American to move in. At that time there was more of an impetus of White people to move out. Pelham Parkway was in the northern Bronx. I moved in there in early sixties. I was around 13 years old.

Interview with Eileen Baker
Colleague and Science Educator
April 5, 2007

During the early decades of the 1900s Melrose, Morrisania, and Mott Haven emerged as some of the initial neighborhoods in the southern section of the Bronx. Neighborhoods and high population density living became a characteristic of urban life. Neighborhoods are physically delimited spaces formed by the interrelationship of social and physical factors (Gonzalez, 2004). Defining neighborhood boundaries is highly

subjective and dependent on many social factors including class, age, gender, race, and ethnicity. State defined neighborhood borders in terms of political jurisdiction and census tract may or may not be consistent with resident definitions of their neighborhood (Hum, 2004). Neighborhoods also interact with the other urban areas and the larger city to which they belong. Neighborhoods can change rapidly to become appealing or unpleasant to live in. As such, neighborhoods and their institutions and residents can garner social images and symbolic capital that help to create associated reputations. The shifting demographics of NYC neighborhoods, accompanied by the intense degree to which different racial and ethnic groups share public space, provide a situation of increasing diversity alongside persistent segregation. These initial neighborhoods became enclaves marked by relative homogenous classes, ethnicities, and races. Factors, such as ethnic homogeneity and familiarity, allowed residents to shape their neighborhood identities and interact in more synchronous ways.

Neighborhoods are also an integral aspect of the immigration experience. For instance, Italian and German enclaves populated Melrose while Irish and Russian Jews populated Morrisania. Public schools became a reflection of the composition of the neighborhoods they were located in. Waves of immigration and the relocation stream of its residents also influenced neighborhood reputations. New and expanding transit lines also impacted the growth of neighborhood populations. The first subway lines into the Bronx extended the current No. 1 and 9 train lines into the Kingsbridge section of the Bronx in 1905 (Gonzalez, 2004). For instance, as the new transit lines and the subway reached the Bronx the Irish residing in Mott Haven began moving north to the Fordham

and Kingsbridge sections of the Bronx. Fordham and Kingsbridge were considered up and coming suburban neighborhoods and were less densely populated at the time. The new subway lines provided cost effective rapid transit between the Bronx and Manhattan. This catalyzed thousands of factory and garment workers to leave tenement and slum areas in Manhattan for newer more spacious apartments in the Bronx. Residents who lived in the Bronx departed to upcoming northern areas and new residents took their place in the southern sections. Many ethnic groups made this move but the largest contingent were first generation Jews from central and eastern Europe and later generations. As New York City grew and additional subway lines opened high-density living became a permanent reality throughout the Bronx and the other boroughs. Today both the number 4 and the number 1 and 9 train lines flank the Kingsbridge section of the Bronx.

Although urban stressors, such as high crime rates, poor schooling and housing, are often attributed to high population density, crowded urban neighborhoods can have a positive effect on building social networks. Large and dense population can lead to the development of increased social networks, subcultures, and groupings that expand social capital. Evelyn Gonzalez (2004) argues that within the Bronx residents created social areas often composed of a street, social block and neighborhood, where residents socialized with family members and friends. These social networks allowed new immigrants and other residents to mediate their daily lives and the process of incorporation into mainstream society. The prevailing ideology about the immigrant experience in the US during the late 19th century was manifested through the metaphor

of the melting pot. This metaphor meant that people came from other nation-states and left behind their old cultures and habits and came together into the "US melting pot" and mixed together. This mixing together was argued to create a new distinctive American identity associated with White Anglo-Saxon Protestant mainstream culture that had little in common with their nation-states of origin. What was assumed was that these first waves of immigrants arrived with the urge to assimilate into a new US mainstream identity. While this ideology can be attached to some immigrants, most immigrants understood that some sort of assimilation was necessary in order to gain access to resources such as jobs, schooling, and improvement of social status. There were many struggles among immigrants, particularly between parents and children, debating how to maintain culture from their place of origin while embracing new US mainstream culture. The ideology of the melting pot was embodied in the curriculum of assimilation in school systems across the US (Cuban, 1993). The curriculum of assimilation stressed the English language, arithmetic, norms of punctuality, and standardization performance that would lead to good work habits suitable for factory positions. Students learned early on how to salute the American flag, were taught to sing the Star Spangled Banner, and were forbidden to speak in their native languages in school. Although, this ideology took hold there were still neighborhoods in the Bronx that were delimited around ethnic, racial, generational immigrants and other differences. Even during the time when the ideology of uniformity and sameness held sway, difference was embodied by the material reality of housing and other sociocultural patterns. Ethnic and other sociocultural distinctiveness existed side by side with efforts to assimilate into a unified mainstream identity- a mainstream identity that proved to be dynamic but dominated by White ethnic groups of

European origins. This unrelenting tension between retaining cultural identity and assimilating into the mainstream culture became heightened during the wave of African American migration to urban centers in the north and the current fourth wave of immigration.

As the US emerged from World War I, immigration quota laws were imposed. The enactment of these laws was mainly due to a new heightened sense of nationalism and nativism ideologies that perceived new immigration and cultural otherness as economic and security threats. The 1924 National Origins Quota Act set quotas that favored immigrants from northern and western Europeans and curtailed immigration from southern and eastern Europe and Asia (Hum, 2004). Layered under this were racist sentiments about the population of Black people already residing in the US. The ideas between citizenship and mistrust were captured in the arguments that the phenotype of black skin historically marked persons as residing outside the protection of the US government and its intended notion of citizenship. This was acutely exemplified in the conflicting implementation of laws and policies throughout US history regarding the rights of African Americans to be US citizens and vote. In the colonial era free Black people throughout the US were able to vote, although some states and territories did not allow Blacks to vote. Approaching the mid 19th century, many states, particularly states in the south, denied Blacks the right to vote. Although African Americans received the right to citizenship, and to the vote, with the passage of the Thirteenth, Fourteenth, and Fifteenth Amendments to the US Constitution, they still faced racial hostility from their fellow White citizens. The confluence of cultural coded racism and ideologies driven by

deficit perspectives of the maladaptive home, community environment, and dysfunctional culture of African Americans portrayed people of color as second tier citizens. Eduardo Bonilla-Silva (2003) maintains that the Black-White continuum still provides the bulk of the themes and imagery for the development of the primary ideas and practices associated with dominant US mainstream racial ideology. The African American community has become a defining reference group for mainstream White America and vice versa. By extension African Americans became a reference point for the American mainstream to interact with other groups, particularly by immigrants of all origins (Wilson, 1998). In other words, there is a racial dynamic that varies by the degree of closeness to "Whiteness" compared to other racial groups that help to preserve mainstream cultural domination by White Americans. For instance, Bonilla-Silva (2003) points out that although Latinos experience housing discrimination, they are less likely to experience it if they are perceived as White than if they are perceived as Black.

Federal immigration quotas were kept in place until 1965. After World War II (WW II), the later generations of White ethnic immigrant groups of European descent assimilated into mainstream America and became the symbolic construction of the American White ethnic group. Their assimilation has been characterized by a straight-line model that suggests the second generation first learn immigrant culture in the home, and then encounters American mainstream culture in school, peer groups, and mass media. This model also holds that second generation immigrants internalize American culture and identity, reject their parents' culture, and label it as foreign (Butterfield, 2004). The assimilation into American mainstream culture and social mobility gained by

these early European immigrants was coupled with their ability to move out of first generation immigrant enclaves. This straight-line assimilation model ignores the impact that large numbers of immigrants have on American mainstream culture. Jews, Irish, and many other immigrants groups have had a large impact on the social structure of many cities such as Boston and New York. Mary Waters (1992) points out that many descendants of American Italian, Irish, German, and Polish immigrants left urban neighborhoods that were ethnically segregated and moved to other urban and suburban neighborhoods. As Eileen Baker described above White middle class residents started to moving in to new housing developments, such as CO-op City in the northern section of the Bronx, as other ethnic groups of color began to move into neighbors in the south Bronx traditional occupied by White ethnic groups. The shifting of ethnic neighborhoods was also facilitated by discriminating housing practices that made developments such as Co-op City mainly available to White ethnic groups to occupy. This discriminatory housing practice is described in more detail below.

The neighborhoods that White ethnic groups moved into were still defined as White, for the most part, but were not linked to any ethnic groups. Some important patterns emerge about White ethnicity in the US. The general patterns for later generations of White ethnics were increased mobility, higher education achievement than previous generations and other ethnic groups, and social mobility into the middle class. Access to mainstream resources and assimilation is often accessed through succeeding generations. This assumes, however, that succeeding generations will adopt mainstream culture and that this culture correlates with upward mobility. Butterfield (2004) notes that

there were differences in the pace of assimilation across European immigrant groups. For instance, eastern European Jews achieved social mobility by the second generation, while it took Italian immigrants several generations to gain similar social mobility. White ethnicity was emergent in the manner that helped it gained symbolic and social capital as being automatically part of and defining mainstream America. White ethnicity also became situational where individuals in this group increasingly have a choice as to the degree they want to identify and incorporate their ancestral ethnicity into their lives. As such, ethnicity is not a permanently inscribed status; it is something, which can be resurrected or submerged as situations dictate. In this case, difference|similarity is both emergent and situational.

The Third and Fourth Waves

The child of matrifocal kin, or mother-base family network, whose blackness seemed simultaneously there and not there, visible to the eye but refracted through the prism of hinterland *jibaro* identity; a child, moreover, of the piedmont and not the "black coast"; and inevitably a child by master narratives of Puerto Rican history that privileged the "interior" as both geography and a trope of identity...(Figueroa, 2005, p. 12)

The third wave can be characterized by internal migration. The migration of millions of African Americans (from southern to northern cities) and thousands of Puerto Ricans (from Puerto Rico to the US) occurred between 1930 and 1965. In the 1930s Puerto Rico was going through urbanization where many inhabitants moved from rural areas to central cities, such as San Juan. During this decade, widespread economic distress and short-lived strikes plagued Puerto Rico. As apart of a New Deal incentive, NYC labor leaders organized seasonal unions of Puerto Rican needle workers (many women) who migrated to NYC to learn dressmaking in the garment industry (Badillo,

2004). This led the way for a large wave of Puerto Rican *jibaro* (rural farmers) families that migrated to NYC between 1946 and 1965. Many initially settled in Brooklyn and Harlem and many eventually moved to the southern section of the Bronx seeking affordable rents. During this same time period, over three million African Americans in the US migrated to the north mainly to seek jobs, better schooling and to escape Jim Crow Laws passed in southern states. Since the early 1900s, until the passage of federal school desegregation laws due to the 1954 *Brown v. Board of Education Supreme Court* case, every southern state had enacted laws that provided separate public schools for African American and White children (Franklin & Moss, 1994). Many court cases prior to the Brown decision affirmed that segregated schools for both races should be equal; however, in most instances there was steadfast disregard for creating schools for African American children that had the same resources as schools that White children attended. Although schools that African American children attended in the northern states had more resources than the southern states, *defacto* segregation and fewer resources for schools that were populated by children of color in the north remain intact. This inequitable distribution of school resources based on race still persists today, even more than 50 years post *Brown v. Board of Education* (Kozol, 2005). As African American families moved north they were urged to send their children to schools that were predominantly Black. This was not too difficult because African Americans lived in primarily Black urban enclaves. New York State provided separate public schools even though in 1938 the state legislatures passed a law that prohibited state (or city) sponsored segregated schools (Folts, 1996).

Similarly, Hum (2004) shows that the most recent NYC 2000 racial demographic based on the census tracts data include persistent segregation of Black neighborhoods that experienced little change in racial composition while incorporating large numbers of Afro-Caribbean and African immigrants. Census tracts where one racial group comprises 50 percent or more of the census tract population define dominant race census tract categories. For instance, dominant Black census tract category is defined by a Black population greater than or equal to 50 percent Black people with no other group that is greater than or equal to 25 percent of the population in the designated spatial area (dominant Black census tract category: Black \geq 50 percent and no other group \geq 25 percent; multi-race Latino-Black census tract category: Latino or Black \geq 40 percent and Latino or Black \geq 25 percent). The high level of Black segregation is evident in the concentration of Black New Yorkers in Black and multi-race Latino-Black neighborhood areas (census tracts). Multi-race neighborhoods in the Bronx are largely Latino-Black neighborhoods clustered in the central Bronx, including Kingsbridge. The exceptions include the Latino-NonHispanic White (NHW) neighborhoods of Throgs Neck and Pelham Bay, and a single Asian-NHW neighborhood in Northwest Bronx. An important question is how did we arrive at the current ethnic and socioeconomic distribution in the Bronx.

Urban Renewal: African Americans, Puerto Ricans, and White Flight

It seems to me that the City of New York has had, for example, Negroes in it for a very long time. The City of New York was able in the last 15 years to reconstruct itself, to tear down buildings and raise great new ones, and has done nothing whatever except build housing projects, mainly in the ghettos, for the Negroes. And of course the Negroes hate it. The children can't bear it. They want to move out of the ghettos. If American pretensions were based on more honest assessments of life, it would not mean for Negroes that when someone says

"urban renewal" some Negroes are going to be thrown out into the streets, which is what it means now.

James Baldwin,
The New York Times Magazine
March 7, 1965.

Seventy-five percent of African Americans settled in urban areas, such as Philadelphia, Chicago, and New York in pursuit of a better life and schools for their children (Franklin & Moss, 1994). For instance, between 1940 and 1960 the population of African Americans in New York City grew from a half a million to just over one million. Similarly, nearly 100,000 Puerto Ricans settled in New York City by the mid 1950s. The number of African Americans and Puerto Ricans living in the Bronx increased to more than 350,000 in 1960 (Gonzalez, 2004). Approximately 75 percent lived in neighborhoods in the South Bronx in the neighborhoods of Mott Haven, Melrose, Morrisania, and Crotona Park East. As African Americans and Puerto Ricans moved into the Bronx, White residents who could afford to move departed to suburban areas, such as White Plains and Long Island, and took with them many job opportunities the new residents of color sought. White residents also moved to the Riverdale and other northern sections of the Bronx that remained segregated and upper middle class. Between 1960 and 1970 there was a 9 percent decrease in the White population and a more than 50 percent increase in the Black and Latino populations in NYC. This population trend continued and became more concentrated in subsequent decades in the Bronx. During the 1980s, there was a 31 percent decrease in the White population and an increase of 9 and 28 percent in the Black and Latino populations, respectively. This ecological change is often characterized as "White flight."

Public and subsidized housing were originally built to entice White and middle class residents to remain in the neighborhoods in the southern sections of the Bronx; however, many White families and upwardly mobile residents moved to the northern sections of the Bronx and to the suburbs. Industrial parks, mega shopping malls, and housing developments opened in the suburbs out of reach of city residents and in communities that were resistant and hostile to the presence of people of color. Discriminatory post World War II Federal Housing Authority (FHA) and Veterans' Administration (VA) mortgage loan programs discriminated against people of color and aided White flight to the suburbs (Gonzalez, 2004). The FHA and VA housing programs were established in the 1930s to help veterans and citizens of all races who were first time home buyers obtain low-interest mortgages. Banks charged lower interest rates to these buyers because FHA and VA guaranteed the loans. The programs were limited to single-family homes and excluded urban apartments and town houses. Many banks used FHA underwriting manuals that included a ban on lending in integrated neighborhoods. This process was known as "red-lining" neighborhoods (Lui et al., 2006). Many African Americans, and other people of color, were locked out of the matrix of homeownership by institutional racism. African Americans encountered opposition from banks, developers, realtors, and White homeowners unwilling to engage them in the process to purchase a home. FHA and VA financed over \$120 billion between 1930 and 1962; less than 2 percent of all these mortgages went to people of color (Lui et al., 2006). The 1968 passage of the Fair Housing Act coupled with numerous Supreme Court decisions barring racial discrimination, particularly against people of color, in financing, housing and

employment produced no substantial decrease in housing desegregation and meaningful social mobility for African Americans and Puerto Ricans. As Lui et al. (2006) argues, home ownership is one of the key ways that working and middle class Whites were able to accumulate wealth, fund their retirement and children's education, and more importantly pass on wealth to subsequent generations.

It is important to note the culture of people of color is not grounded in poverty. For many in this wave of migration to the Bronx employment and access to resources failed to materialize even in the face of Civil Rights Legislation spearheaded by the Black Power Movement in the 1960s and 70s. As James Baldwin describes above the infrastructure that was in place in New York City and the Bronx that helped early White ethnic immigrants achieve social mobility eroded at a time when African American and Puerto Ricans needed them the most and were situated to access them. This situation help areas such as the Bronx descend into urban ghettos. As discussed earlier, White families moved out of the city and African Americans and Puerto Ricans moved in. The racial and economic composition of the neighborhood public schools in the Bronx changed drastically and continues to persist today.

In 2001, 75 percent of the students in NYC (more than 90 percent in the Bronx) were Black and Latino. The fiscal capacity to fund schools in NYC also declined relative to other school districts in the suburbs. The decline of fiscal capacity was partly due to the erosion of the tax bases and the increased demand for other public services for a growing and highly concentrated urban population (Kantor & Brenzel, 1992). Kozol

(2005) showed that the existence of a dual school system in NYS using per pupil spending (pps) and associated geographic data. In the 2002-03 fiscal year, pps in NYC was \$11,627 where the student population was 72 percent Black and Latino and 28 percent White and other ethnic groups. During the same fiscal year, the pps in the nearby suburbs of Great Neck (11 percent Black and Latino student population, 89 percent White and other ethnic group population) and Bronxville (1 percent Black and Latino student population, 99 percent White and other ethnic group population) were \$19,705 and \$18,788, respectively. Kozol also argues that even within the NYC public school district, different regions within the district are able to close the fiscal disparity somewhat by the efforts of an active White and middle class parent base. He notes that parents in these regions have strong Parent Teacher Associations (PTA) who are able to raise thousands of dollars through their social networks outside the school. For instance, the PTA associated with a neighborhood public school in Park Slope, an affluent middle class section of Brooklyn, NYC, was able to raise more than \$100,000 dollars yearly to employ a science teacher and two art instructors. In contrast, the PTA of a neighborhood public school located in a low-income immigrant community in the Bronx raised less than \$5,000 dollars through various fund raising activities (personal communication).

The Cinema of Urban (Inner City)

Immigration and the continually changing demographic profiles have sculpted places like NYC into an urban center filled with diversity. These cultural and physical shifts are directly connected to access to resources within New York City and in its public school systems. These shifts are also often related to the creation of symbolic and social capital associated with particular neighborhoods. Although there have been

neighborhood "slums" populated by European immigrants in the first two waves of immigration, the social mobility into the mainstream achieved by these groups of immigrants deflected permanent stigmatization associated with impoverished neighborhoods in the early 1900s. As Pedro Noguera (2003) points out, the term "urban" has both physical and cultural connotations. The term urban conflated with other terms like inner-city describes a relatively poor, in many cases, non-White group of residents. For instance, common historical experiences, shared vocabulary and images often fix frames of references without regards to shifts and changes that actually make up the lives of residents in the Bronx. This helped to shape the borough's image. In the late 60s and 70s the Bronx, particularly neighborhoods in the South Bronx, garnered a national reputation that symbolized urban (inner-city) physical decay, poor housing, crime and instability. This image was burned into the American imagination in 1977 when President Carter, and then presidential candidate Reagan in 1980, used Charlotte Street in the South Bronx as a backdrop to pledge federal help to revitalize the Bronx and other urban centers throughout the country (Gonzalez, 2004). What further solidified the Bronx's image was the popular motion picture *Fort Apache, The Bronx*, released in 1981 that depicted life in the South Bronx through the experiences of two police officers that work in a police precinct in the Bronx nick named Fort Apache. In the film, and in the social imagination of the US and the world, blight and decay were associated with African Americans, Puerto Ricans, and other people of color. Although residents in the Bronx dealt with the day-to-day realities of urban stresses, they also exercised their agency to improve their conditions. Within urban decline were the seeds that helped to renew many Bronx neighborhoods.

The 1970s was a period of devastating decline for the Bronx. The diversity in the Bronx remained; however, it was a shift from among White ethnic groups to Black and Latino ethnic groups. Segregation also ensued based on racial and economic lines. Between 1970 and 1977, 300 companies went out of business or moved out of the Bronx (Gonzalez, 2004). Old housing was demolished and never built back in abundance. The decline of many Bronx neighborhoods and their housing stock was also due to landlords who abandoned buildings and burned out building lots. Compounding this demise were laws that were passed that allowed public employees to live outside the city limits. These laws allowed Whites and upper class residents to maintain and compete for jobs in the city while living and commuting back and forth to the suburbs. Highways were also built from the cities to carefully zoned suburban neighborhoods that aided suburbanites to travel and access jobs in the cities. This meant fewer jobs for Bronx and NYC residents. By 1984, 55 percent of the families in the South Bronx were below poverty levels and 39 percent were receiving welfare assistance (Gonzalez, 2004). African American and Puerto Rican migration to New York slowed in the late 1970s. By the 1980s, African American made up 30 percent and Puerto Ricans 34 percent of the total population of 1,168,972 in the Bronx (Hum, 2004). As this wave of immigration started to wear off familiar questions about ethnicity and race and the distribution of resources took hold. Demographic changes that occurred during this wave of immigration were also reflected in high schools in the Bronx. This was also compounded by the subsequent wave of other Black and Latino ethnic groups that settled in the Bronx throughout the decades of the 80s and 90s. This served to hyper-concentrate Black and Latino families in the Bronx and by extension Black and Latino students in neighborhood high schools in the Bronx.

By 1998-2001, the student body of most comprehensive high schools in the Bronx was made up of more than 90 percent Blacks and Latinos (Kozol, 2005). For example, 91 percent of the student body at John F. Kennedy High School was Black and Latino and 4.5 percent of the students were White. While at the very elite specialized high school, Bronx High School of Science, in the northern section of the Bronx, less than 15 percent of the students are Blacks and Latinos. The demographic and access to resources is disparaging particularly when one notes that approximately 70 percent of the student body in NYC are Blacks and Latino. Today, neighborhoods that make up the 16th congressional district-South Bronx, Fordham, and Kingsbridge- remains one of the poorest districts in NYC (U.S.-Census, 2000). This has obvious implications for the economic diversity of public schools in this district.

Macro Policies: Changes in Immigration Quota Laws

A fourth wave of immigration into the Bronx emerged in the 1980s. This wave of immigration was made possible due to a 1965 amendment to the McCarran-Walter Immigration and Nationality Act of 1952 that abolished immigrant quotas previously set in 1924 (Pedraza, 2006). The primary criteria for legal admission to the US showed preference to immigrants whose occupations were in demand and for family reunification. Immigration laws based on family reunification favored immigrants whose immediate family had been divided by migration. On the other hand, immigration laws based on occupation gave preference to both working class and middle class occupations that needed to be filled, such as menial services jobs and professional occupations. The reception of new immigrants during this era is exemplified by the post-industrial

economy and unprecedented multi-race, multi-ethnic re-characterization of local neighborhood settings. Pedraza (2006) notes that in recent years occupational preference has been given to the often poorer immigrants, such as Mexicans, Puerto Ricans, Dominicans, and Jamaicans, who were frequently contracted to work in the field, construction jobs, and to skilled immigrants, such as Colombians, Filipinos, Asian Indians, Koreans and Ecuadorians, who were contracted to work as doctors, nurses, computer technicians, and science and math teachers. Immigration laws based on a two-tier occupation preference fed into a highly segmented labor market already in place in the US. In contrast to those immigrants in the second and third waves who supplied cheap labor essential to industrial expansion in urban centers, immigrants in the fourth wave arrived in a postindustrial service based economy. Many immigrants in this wave arrived with colonial and postcolonial histories, from regions dominated by the US economic and military interests.

In 1986, the Immigration Reform and Control Act offered amnesty for undocumented immigrants who entered the US illegally. Many undocumented immigrants, particularly Mexicans who benefited from this reform act, were able to gain legal employment and associated benefits for their contributions to the economy. From 1980 to 2000, the overwhelming majority of immigrants entering the US came from Asia, the Caribbean region, Central and Latin America. In 1990, of the 8.4 million immigrants who were born in Latin America, 4.3 million came from Mexico, 1.9 million from the Caribbean (most from Cuba and Haiti), 5.4 million from Central America and 1 million from South America. This post 1965 wave of immigration in NYC has been characterized

by the diversity in nation-states of origin and the geographic concentration in key neighborhoods. However, similar to the first two immigration waves, a pattern of chain migration persists. Networks of immigrants who tend to settle near family and friends and find their residence through these informal networks characterize the social phenomenon of chain migration. For instance, among the largest immigrant groups in the boroughs of Manhattan and the Bronx is Dominicans. Although immigrants from the Dominican Republic made up one of the largest groups of newcomers to NYC, they were less than one-third of immigrants received in 1990s. Many other Latino immigrant groups, such as Colombians, and Mexicans, joined Puerto Ricans in NYC, particularly the Bronx. According to the US 2000 Census, Puerto Ricans (319, 240) and Dominican (133, 087) made up the majority of Latinos in the Bronx. The census also showed an increasing number of Mexicans (34, 377) and Black immigrants settling in the Bronx. In 2000, Latino immigrants were 34 percent, Black. From the mid 1980s to 2000, the population of Latinos (27 percent) in NYC surpassed the African Americans (25 percent), making them the second largest group after NHW (35 percent) (Hum, 2004). During this time, the population of NHW decreased by a net percentage change of 17 percent. These racial changes are associated with a significant amount of ethnic diversification of NYC's Latino and Black populations.

Black immigrants constitute approximately 7 percent of the foreign born population and 6 percent of the Black population in the US (U.S Census, 2000). Since 1900 to 2000, the population of foreign-born Blacks in the US has increased from twenty thousand to two million people. US 2000 census data indicate that the largest stream of

Black immigrants into the US came from nations in the Caribbean and Africa. The majority of Black people who come from the Caribbean come from Jamaica (553,827), Guyana (211,189), and Trinidad and Tobago (197,398), while the majority of the Blacks originating from Africa came from Nigeria (134,940), Egypt (113,396), and Ethiopia (69,531). This change in immigration pattern has challenged the construction of Blackness and the traditional role African Americans have played in constructing Black identity in the US. Unlike European immigrant groups in the first two waves, recent Black immigrants groups have experienced the stigmatization of people of color. This is primarily due to the historical construction of Blackness in the US. Many recent Black immigrants from the Caribbean and Africa arrive in the United States with pre-existing national identities and ideologies about themselves and others. These immigrant groups come from regions where Blacks constitute the racial majority and often hold positions of local leadership and authority. In these regions, social class may play a greater role than race. Much of this authority structures social advantages and disadvantages; however, the authority is still within a subjugated post- and neo-colonial relationship with the US and European countries (Stavenhagen, 1999). Race in this global political sphere is nuanced differently in the midst of these emerging colonial relationships.

The severe racial and economic discrimination experienced by African American has led many first generation Black immigrants to resist assimilation into a racialized social space which may facilitate downward mobility. Even though Black immigrants are constrained in their attempts to disassociate with African Americans, because of similar skin phenotype, they then move into existing Black neighborhoods. What

emerges from this experience are the multiple trajectories of second-generation children of Black immigrants. The mode to which second generation Black immigrants incorporate themselves into the US society may depend heavily on the resources garnered by the first generation. Immigrant parents, to the degree that that can access resources through economic, cultural and social capital, create differential opportunities and pull on allegiances on the second generation (Butterfield, 2004). For example, second generation immigrants who face extreme discrimination and whose parents lack the means to provide upward mobility may develop stances similar to those held by African Americans towards mainstream White society. Waters (1999) identifies three general identities, a Black American identity, hyphenated national origin identity, and an immigrant identity. These identities are not static and like other identities are constantly being created and recreated. The extent to which these identities are embodied and intersect also depends heavily on how different perceptions and understandings of race, ethnicity and opportunities are interpreted. The development of these attitudes and identities are very complicated and act to create demarcations in social encounters.

Multiple Quandaries

It [quandary] comes from those who have seen the everyday. They represent an idea of action and agency more complex than either the nihilism of despair or the utopia of progress. They speak of the reality of survival and negotiation that constitutes the moment of resistance, its sorrow and its salvation, but is rarely spoken in the heroisms or the horrors of history. [Toni Morrison's] Ella says it plain: "*What is to be done in a world where even when you were a solution you were a problem?*" (Bhabha, 2006, p. 362)

For Black and many Latino immigrants, as well as African Americans, skin color triggers stereotypes leading to discrimination and negative perception. Tormala and Deaux (2006) argue that first-generation immigrants might perceive racial identity-

threatening situational cues in encounters differently than Blacks who were born in the US. To the degree that Black immigrant identities are mediated through agency/passivity, encounters may be subjected to a pattern of identity formation that serves to define self across varying academic and employment opportunities. For example, Caribbean American might use Caribbean accents and wear national symbols that signal a different Black ethnic and national identity different from African Americans. In this manner, Black immigrants attempt to avoid being the victim of racial stereotypes triggered by black skin phenotype historical associated with African Americans.

Tormala and Deaux (2006) also argue that African Americans and second-generation Black immigrants are more influenced by the embedded social and historical meaning around Blackness in the US. Perhaps the absence of a US brand of racial structure in their nation-states of origin may continue to influence perceptions after initial immigration to the United States. For example, in nation-states where many Black immigrants immigrate from, social class or religious affiliation instead of race may be the dominant basis for discrimination. Consequently, Black immigrants might be initially more sensitive to issue of class than racial discrimination. As such, Black immigrants (and other immigrants) pull on their experiences from their countries of origin to create hybridized (interstitial) culture to navigate their day-to-day lives. Black immigrants find themselves in a new social space where they must also learn to negotiate what Wade Boykin (1986) refers to as the triple quandary. The notion of the triple quandary is constituted by three realms -mainstream, African-rooted African American culture, and the status of oppressed minority. Boykin argues that African Americans are in a unique

social space where they must navigate these three realms. For immigrants, the status of being inscribed as an oppressed minority may impart resistance to initially reckon with a racialized social structure. As such, Black immigrants also find themselves embedded within Boykin's triple quandary with an added dimension of navigating the meaning of Blackness embedded in US society. African Americans also find themselves in this new dimension where the potential to redefine Blackness through an amalgamation and confluence of global Black experiences brought about by immigration in places like the Bronx.

Conclusion

Globalization has had a profound affect on NYC especially neighborhoods in the Bronx. Instant communication networks, changes in demographics accompanied by particular waves of immigration have brought people together in new ways and circumstances. The building of new cultural fields provides fertile ground for global exchange of culture that creates new entry points into ways of thinking about social encounters. These global exchanges of culture saturate meso and micro levels of social life. A significant feature of this phenomenon is the creation of similarities and differences brought about through immigration. Communities in the Bronx have received approximately 180,000 immigrants between 1990 and 1998 (Hum, 2004). The majority of these immigrants are Black and Latino. The settlement pattern of immigrants suggests that the urban landscape in the Bronx must confront a post-industrial economy that mediates the encounters across ethnic experiences in order to build a revitalized community. Recent immigrant communities and families, whose second generation youth become citizens in the receiving country, often become the focus of public

attention due to demands on social services, such as education, housing, and employment. Although there is a current positive trend in overall societal acceptance of immigrants, educating children from diverse cultural backgrounds is still perceived as problematic (Adams & Kirova, 2007). What informs these challenges is a nuanced understanding of how these cultural phenomena unfold in fields within the classrooms. As new cultural forms get enacted in the lifeworlds of students and teachers, they also cross porous field boundaries and present themselves as resources that inform teaching and learning of science.

CHAPTER 3

Being, Becoming, and Belonging: The Convergence of Shared Responsibilities

Through Emerging Experiences in Urban Science Education

Introduction

The proceeding metalogue is a literary composition that expresses the reciprocal conversation among five participants. Each of us, despite differences along age, racial, ethnic and gendered latitudes, contributes our unique personal experiences and thoughtful insights into some of the complexities involved in urban science education. Belsey (1980, p. 105) posits that, "in plural text all statements are of indeterminate origin, no single discourse is privileged, and no consistent and coherent plot constrains the free play of discourse... At the opposite extreme, the readable text is barely plural [and] merchandise to be consumed, while the plural text requires the production of meaning through the identification of its polyphony." From our diverse standpoints, we use this metalogue as a vehicle to give voice to our interpretations, agreements, and disagreements, as we address salient issues that link being and becoming science educators while simultaneously "belonging" to New York City (NYC). We also use this metalogue to ratchet-up the conversation that Wesley Pitts began in chapter 2 about the emerging ecology of the Bronx.

The participants in the metalogue are all urban science educators in NYC. They are acquainted as science educators and researchers associated with The City University of New York Graduate Center, Urban Education Program. Eileen Baker, a veteran science educator, grew up and started her teaching career after immigrating to the Bronx

as a child. Rey Llena also immigrated to the Bronx as an accomplished environmental chemist and became interested in science education. Christopher Emdin started his career as a science educator in Brooklyn and was invited to participate on the planning committee to open what became New York High School, in the Bronx. He eventually became assistant principal of science at NYHS. Rey and Chris both worked together as members of the science faculty at NHYS. Nicole Grimes began teaching science in independent schools and out-of-school science programs throughout NYC after completing a degree in engineering and relocating to NYC from New Jersey. Wesley Pitts started his career as a science educator working with university-high school collaborative science and mathematics programs in NYC. Wesley became associated with NYHS as a university researcher.

The metalogue was constructed by initiating commentaries associated with chapter 2 in this dissertation. Participants used their agency to introduce and/or respond to issues they deemed salient. In this way, the metalogue was constructed in a coordinated fashion. Yet organization around the themes emerged organically. To that end, Eileen initiated the metalogue by contributing three salient points each articulated in one or two paragraphs. Other participants took turns responding and introducing new avenues for discussions at various points within the metalogue. After each section was organized by related themes, participants were afforded one extra round to make additional contributions. Nicole and Wesley appropriated the responsibility for writing and co-editing the introduction and conclusion sections of the metalogue.

In the first section, *Mapping the Terrain: Enduring Legacies and New Challenges*, we engage in a dialogue that centers on immigration and the Bronx as sites for the development science educators. All except one of us have intimate ties to the Bronx - either through residence or via professional relationships with schools in the borough. In the second section entitled *Being Beyond the Classroom: Engaging Who We Were and Who We Are*, we lend insight into the struggles of transformation as we ventured to augment the construction of success as science educators. Through personal accounts of our own encounters, we offer stories of crossing barriers to afford opportunities in teaching and learning. The next section, *Science Teaching: Knowing Passion, Patience, and Perseverance*, is at heart an anthology of our primary experiences as new science educators in the public and independent school systems. As these stories unfold, much about the intricacies involved in achieving shared responsibilities in science education is explored. The final section, *Planting Future Roots in Science Education*, offers emerging and tactical practices, that foreground transformative change sensitive to teaching and learning. Overall, the stories offered in this metalogue are not intended to paint a generalized picture of all of NYC, its schools and science classrooms, or the experiences of new teachers. Rather, they serve to provide some depth of understanding to urban circumstances in the teaching and learning of science.

Mapping the Terrain: Enduring Legacies and New Challenges

Wesley: The ecology of the Bronx, like NYC, has been driven by many large housing development and highway projects that seem on the one hand to provide vitally needed housing and travel services, and on the other hand feed social class, racial, ethnic, and physical segregation. For instance, the Cross Bronx Expressway and the Gowanus-Belt

Parkway exchange in Brooklyn have served to physically and socially cut off the South Bronx and Red Hook from the rest of their associated boroughs, respectively. Both highways were built to provide a convenient way to get from commercial areas in NYC to suburban areas outside the city. Large housing projects were built in various locations in these neighborhoods and more affluent neighborhoods such as Co-op City. These civic projects along with housing discrimination balkanized populations based on race and income into different areas of the city. Large housing complexes can become a symbol of affluence or poverty. Similarly, when commercial movies are made about high poverty inner city neighborhoods, such as *Fort Apache the Bronx* (1981), referring to the South Bronx, and *Straight Out of Brooklyn* (1991), referring to Red Hook Brooklyn, deficit perspectives about these communities are solidified in the popular social imagination. These neighborhoods are repeatedly associated with the legacies of poverty and poor schooling. Valencia (1997) points out that negative images fuel the culture of poverty perspectives positing that autonomous and self-sustaining cultural systems of the poor are thought to be carriers of deficits and subsequent problems, such as school failure. From this ideological sphere of deficit thinking familial and home environment become a source of a predictive deficit modeling and a location for prescriptive approaches. As such, deficit thinking is a person-centered explanation of school failure among individuals as linked to group membership (typically, the combination of racial/ ethnic minority status and economic disadvantage). In other words, poor schooling performance is rooted in students' alleged cognitive and motivational deficits, while institutional structures and inequitable schooling arrangements that exclude students from learning are exculpatory (Valencia, 1997).

Eileen: In the late 60's and 70's the Bronx deteriorated physically. The Bronx was burning. It was more cost-effective to get insurance money for the buildings (some of which were absolutely gorgeous) than to rent them. So they burned. Heroin moved in and became the friend of too many. It was the time of drugs all around. The smell of marijuana was everywhere, in the school bathrooms and hallways. Many programs tried to help the schools, but nothing stemmed the downward decline. I joined the faculty at Taft High School in the Bronx in 1969. During my five years there, the administration tried an annex where they had a College Prep program. That had some success because they placed the most dedicated and activist teachers there. As Wes mentions on page 27, paragraph 1 there was and still is a great disparity among the amount of money spent on schools in the city, and on the nearby suburbs. The district where I worked remains one of the poorest districts in NYC. Although I left teaching in the Bronx in 1973, I kept in touch with faculty for many years. The teachers who had been present when "White flight" changed their school, retired. Others took their place, and my school was turned into several mini schools. However, it still remains in the lowest academic ranking in NYC.

Nicole: I find it extremely provocative to read about the Bronx as this extremely racially and ethnically diverse borough plagued by symbols of destitution. At the same time, my base knowledge of schooling in the Bronx has been limited to the Bronx Science high school. I met and befriended many Asian Americans who attended this elite school while I was an undergraduate at Cornell. When I met Wellie, John and Makiko as college freshmen, all Asian Americans, and Rudy and Juana, Dominican siblings from

Huntspoint, who all graduated from Bronx Science, I developed completely different ideas about the Bronx and the types of people that lived there. My perceptions about the racial groups that lived there was limited and plainly stated, quite off. I thought that the Bronx was the sole home to the Latino/a community and true hip-hoppers (thanks to the Lord Tariq & Peter Gunz's 1998 song "Deja Vu" – "Well if it wasn't for the Bronx, this rap **** probably wouldn't be going on!"). I also met many other peers who attended Brooklyn Technical High School and Stuyvesant High School, two other elite NYC public schools. They were also all Asian. After living in NYC for six years, I now know of the great diversity that is present in all of its boroughs. The Bronx is currently home to a plethora of racial and ethnic groups. However, in retrospect, I think it is impossible not to interrogate the structures that perpetuate the placement of students like Wellie to attend such prestigious schools despite not even being a resident in the borough. From my experience, these few Asian Americans I met as undergraduates became the primary faces of these NYC schools. Non-NYC residents would not obtain a true picture about the predominant members of its localized communities. What is also interesting is that these peers I mentioned above were all second-generation immigrants in the same way that I was involuntarily and naturally "representing" Jersey City youth at Cornell, even though I knew very little about anything there. I lived there for two short years when I migrated to the U.S. and then relocated to upstate New York to begin college. Likewise, my Asian American friends were representations and perhaps even spokespersons for the Bronx despite not being residents there.

Eileen: Nicole, I attended Bronx Science. When I was there in the mid 1960's it was not as racially diverse as it is today. As you mention, students then, and still today come from

all the boroughs to attend the specialized schools. Entrance was and still is by exam, and I feel that students that come from the public elementary schools and junior highs from the Bronx today aren't as prepared to take the exam as the students who attend private schools and take the test for the specialized schools as well. Even when I went to Bronx Science there were students from private schools. In addition, when I went there, there was a quota for females. Only one third of the class was allowed to be female. At least that has changed. I got a wonderful education there and I agree with you Nicole, that it is salient that all have an equal chance to be exposed to these opportunities.

Chris: I spent a majority of my youth in Brooklyn and attended Brooklyn Technical High School. At the time, the school's population was very diverse and a majority of the students grouped themselves by ethnicity. Among the African-American students that I spent most of my time with, there was one Indian-American young man who was part of our clique. The reason that he spent time with us was because of the fact that my friends and I were very interested in hip-hop and so was this young man. Even though we often teased him when we spent time together, he continued to spend time with us because he loved hip-hop and was an amazing beat-boxer. When we would get together in the cafeteria to rap, there were many occasions where other students would group us all as the loud Black kids even though we had an Indian-American student in our group. When my family moved to the Bronx, towards the end of my first school year, I would take the train to Brooklyn Tech everyday. I refused to take the test to enter the specialized high school in the Bronx because my friends in my new neighborhood knew about the "geeks at Bronx Science" but perceived Brooklyn to be cool. Back in Brooklyn, I was perceived

to be the rough kid from the Bronx. I make these points to outline once again how perceptions of the other are so important to interrogate. At one point I was a loud member of the all Black hip-hop group, a cool kid from Brooklyn and a rough kid from the Bronx and in actuality none of these identities inscribed on me was any indication of who I was.

Nicole: Wes provides valuable insight into the immigrant history of the Bronx and the statistics of various ethnic groups that have relocated there mainly over the last fifty years. A vibrant canvas of the racial diversity present in the Bronx is painted. However, it is quite apparent though, that racialized groups are not the sole foundation for discourse about diversity here. I think it goes without saying that we absolutely have to delve deeper and begin to dissect the ethnicities of each racial group in order to understand the complexities of communities like the Bronx. Firstly, we must agree to consider *race* as a socially constructed category drawn from one's physical appearance and distinguish it from *ethnicity*, which operates based on one's national origin, language, religion, food and other cultural markers (Butterfield, 2004). In particular, I would like to refer to the divides that are created amongst Black immigrants in NYC. The 2000 U.S. census data indicate that the largest stream of Black immigrants into the U.S. continue to come from the Caribbean and Africa. The majority of these Afro-Caribbeans are from the Anglophone Caribbean; mainly Jamaica, Guyana, and Trinidad and Tobago. Apart from the obvious sub-divisions based on land of origin, there are also deep-seated divides in the Caribbean immigrant group based on whether one is a first or second-generation immigrant. First-generation Black immigrants have historically identified strongly with their homes of origin and distanced themselves from native African Americans.

However, various studies of second-generation immigrants have provided insight into their unique assimilation processes. Mary Waters (1994) found three types of identities among second-generation Caribbean: a Black American identity, an ethnic or hyphenated national origin identity, and an immigrant identity. Affiliation with one of these groupings is intimately connected to the existing neighborhoods in which an immigrant is situated. The presence of more of one's countrymen or a general similarity in background fosters a more intense island-identity (When asked, a respondent will most likely state for example, "I'm Jamaican" or "I'm Trini",) while residence in more ethnically heterogeneous areas, like parts of Queens, creates a pan-Caribbean identity (A respondent will most likely state, "I'm West-Indian" or "I'm from the Caribbean"). It is easy to see that ethnic identity is a dynamic construct and is constantly renegotiated in different developmental and social contexts. Consequently, these differences will continue to shape social behavior, networks and between groups. However, not only will degree of interaction between ethnic groups and subsequently racial groups be affected, but also the very nature of how each of these groups are defined and perceived. I think we must caution ourselves not to regard immigrant groups as merely 'adding to' numerical data on existing Black or Latino/a racial groups. We should begin to deeply interrogate the ways in which contemporary immigrants are constantly redefining what it means to be Black or Latino/a and how these emergent identity ascriptions and transcriptions transform societal structures at micro, meso and macro levels.

Rey: Changes in Immigration Quota Laws based on family reunification have brought more than 100 families of Filipino nurses to the northern part of the Bronx in the early

1990s. Most of these families have 2 to 4 young children in elementary grades. These families have concentrated mostly in the Riverdale area because of the proximity of an excellent elementary school and a Catholic church. Other families chose to send their young children to private schools. Being part of this new wave of Filipino immigrants (families of nurses), I watched how the educational and religious institutions responded to the changing ethnic landscape in Riverdale. The school started to hold a “Multicultural Festival” every year where families in their traditional national costumes got together, bringing foods from different parts of the world. The church has also changed the composition of lay ministers serving the congregations to include parishioners from different ethnic groups. As Nicole pointed out, we must agree to consider *race* as a socially constructed category drawn from one’s physical appearance and distinguish it from *ethnicity*, which operates based on one’s national origin, language, religion, food and other cultural markers (Butterfield, 2004). In the case of Asian immigrants, I did not see a wider divide between ethnicities when using children’s education as a driving force. Most of the Asian children competed for top posts in their respective classes and ended up passing the entrance exam in Bronx Science in their high school years. I agree with Eileen that students that come from the public elementary schools and junior highs from the Bronx today aren’t as prepared to take the exam as the students who attend private schools and take the test for the specialized schools as well. What most of us (parents) did was to spend extra money to pay for the 3-month (GRF) review before allowing our children to take the exam for specialized high schools. Asian children (from India, the Philippines, South Korea, and China) did manage to mingle with the native White children during the review without much of a problem. I only

remembered one time my child who went to Bronx Science in her high school telling me that some of their classmates teased Asian students about being “nerds” and accused them of having no social life. What these Asian students have been doing is “just study and study.”

Wesley: Nicole and Eileen offer interesting perspectives on how identities, particularly ethnic identity, become both emergent and situational. In other words, identity is field dependent. As we traverse different fields, and even within the same field, we assert different identities depending on the structures that create the fields and mediate encounters in it. Consider for a moment that you are conducting a workshop where your mentor is also present. You enact an identity as a workshop leader and can quickly enact an identity as a mentee when you step over to her to ask for advice in conducting the next phase of the workshop. In this same light, Nicole and Eileen describe the necessity to interact with their parents using speech, dress, and other social cues that create resonance structures that their parents could easily recognize as being coparticipants in a particular ethnic framework. It is really developing the ability to create cues that helps to build affiliation and solidarity with regular and new field participants. It seems that being able to cross ethnic boundaries fluently became necessary to create successful social encounters. Nicole also describes the different ways that sub-ethnic groups (e.g., Black Caribbeans from different nation-states in the region) would telegraph a pan-Caribbean identity and during other types of encounter telegraph an identity that is particular to a nation-state in the Caribbean - perhaps through garments they wear or by speaking in a dialect or language specific to a nation state. I notice this a lot in my family. I would be

considered a 1.5 generation Caribbean immigrant. My parents are from Belize and I came to the United States at the age of three. I identify as an African American male with pan-African sensibilities. Like the participants in this forum, I have noticed changes in my thinking and actions as I grew into adulthood. What is also interesting to me is looking at the changes in ethnic construction that my family members, particularly my parents, and I have also gone through. Although my parents are still quite Belizean (my father has a sticker of the Belize flag on his car, commemorates all Belizean national holidays, and exhibits Belizean nationalism), I also see him embracing the politics of the African American struggle in the US. My mother has become very sophisticated in navigating the financial systems and city bureaucracies in the US. I recall a time when they refused to have a credit card or assert their rights for social services. What is sticking to me is the way they have created a hybrid or interstitial culture that allows them to foreground different identities (Belizeans in the diaspora, Black American, grandparents in the US, union member and former civil servant in both countries) depending on the encounters in the fields they navigate/traverse.

Chris: Many of the issues that have come up in our discussions are closely related to my use of neo-indigenous cosmopolitanism as a methodology for looking at the dynamics among urban populations within and outside of the classroom (Emdin, 2007b). Neo-indigenous cosmopolitanism describes the need for the attainment of a cosmopolitan ethos among populations whose ancestors come from various putative places of origin. These individuals presently live in close proximity to each other in urban settings. To be neo-indigenous, an individual must be tied to a part of the world where oppressive structures such as colonialism have had a major imprint on indigenous populations.

Concurrently, the neo-indigenous person deals with victimization by more contemporary (usually socioeconomic) forms of oppression in the places where she presently makes her home. With this broad definition and description in place, we can classify many of the recent waves of immigrants into the United States as being neo-indigenous. Furthermore, we can look at neo-indigenous cosmopolitanism as a way to understand the relationships among neo-indigenous populations. In order to engage in cosmopolitanism, it is necessary for an individual to live out two fundamental tenets. Firstly, it is important to hold a responsibility for the other or for others in spite of their differences. Secondly, it is necessary to value the differences among people. In order to abide by these tenets it is necessary to find the ties that bind individuals to each other that can cause them to exhibit this responsibility and/or value for the other. Very often, the attainment of a cosmopolitan ethos comes with the dismantling of stereotypes. This occurs through the experiences of the neo-indigenous that dismantle preconceived notions of each other. Nicole describes her experiences with students from Bronx Science that dismantled her ideas about the Bronx that came from a rap song. Through the experiences that she had with her friends in the University, she was able to dismantle existent stereotypes that may have caused her to have a negative idea about the Bronx. Her vision of her friends as others in their home settings combined with her vision of the Bronx as the birthplace of rap and an awareness that both were accurate descriptions of the way things are describes neo-indigenous cosmopolitanism. This concept is also described in Nicole's description of the Caribbean identity that comes when a heterogeneous mix of Jamaicans, Trinidadians and others live in the same neighborhoods. I argue that this is a phase of neo-indigenous cosmopolitanism that may or may not foster the addition of other groups into this mix. If

for example an influx of Dominican-Americans moved into the “West Indian” community that Nicole describes, there is a possibility of a conjoining of the Caribbean against the newcomer or a joining of forces with the Dominican-Americans to create a more hybridized Caribbean and Latino/a culture.

In the case of Wes’s parents, their experiences within the United States as Black and Belizean caused them to realize that there was more to the label imposed upon Blacks or African Americans than any negative preconceived ones. In fact, their acceptance of Blackness or African Americanness describes their value or respect for African American culture and their embracing of Black American struggle within the U.S. connotes a responsibility for the other through a being of the other even though a distancing from African Americans may have been possible. I argue that the ability to embrace multiple subcultures and successfully navigate various social structures and systems comes with the acceptance that one is neo-indigenous. That is to say that there is an awareness of the oppression that one experiences within the multiple roles that one inhabits. If an individual embraces any single identity and places no value on any of the others, both the identities that she values and devalues would undergo oppression at the hands of dominant societal forces. It therefore only makes sense to engage in solidarity with all others who hold multiple identities and are collectively neo-indigenous in urban areas. Unfortunately, opportunities to dismantle preconceptions or the know-how to come together with others (despite the collective oppression and domination by larger society) to address the structures that oppress are not afforded to many of the neo-indigenous.

Wesley: Chris you also described constructing identities associated with hip-hop and urban youth of color. You describe garnering capital (e.g., rough, tough, and cool) among peers from these identities related to urban inner city neighborhoods in Brooklyn and the Bronx that you associated with. Although you also admitted you did not feel this was whom you really were, you built these types of diasporic identities to navigate new terrain and avoid being inscribed as different. These identities also seem to rely on oppressive negative stereotypes of urban youth of color and neighborhoods of color. What type of lens do you use to examine ways of dismantling stereotype and building solidarity across difference?

Wesley: Chris your notion of neo-indigenous cosmopolitanism is interesting. Your description of a neo-indigenous person ascribes the markers of victimized and oppressed at the center of their diasporic identity. The referent "neo" alerts us to the social location and category of a new context and condition. Within the neo-indigenous cosmopolitanism, you suggest a formulation that represents an oppressive connection to the homeland of the neo-indigenous person. Cosmopolitanism informs this framework by asserting that a neo-indigenous person must hold a responsibility for the other(s) and value difference for other people. Neo-indigenous cosmopolitanism provides a conceptual framework to understand difference and sameness as a dialectical encounter in which "victims" and oppressor internalize aspects of the other, at both the levels of the individuals and the social. The internalization is both conscious and unconscious. Through this prism, there is no surprise that race and ethnicity along with cultural and political transitions intersect and shape life experiences in the diasporas of the neo-

indigenous and indigenous. I would like to argue, however, that within the processes of enacting neo-indigenous cosmopolitanism, there exist the seeds of resistance that contribute to the development and structure of encounters contained in new dominant modes of culture. A recurring gaze at the articulation of difference reveals new boundaries and limits from the space of otherness. The indigenous finds herself in a new cultural space formed partially out of historic ties to cultural precedence and geographical terrain. On the other hand, the neo-indigenous attempts to discern features that create new affiliations and relationships that guide her right to cultural and geographical residency in the new ecological space shared with the indigenous. It is interesting to look at the framework of neo-indigenous cosmopolitanism using the filter of first person/third person perspective. From the first-person perspective the neo-indigenous and "indigenous" individual (or group) can experience resistance in occupying a new cultural space (diaspora) that no one can claim indigenous origins. Stuart Hall (1990, p. 9) articulates the third person perspective where the contradiction is seen as a static cultural space "defined in the essence of purity" that is false in the presences "of necessary heterogeneity." At the emerging "junction point(s)," where many cultural tributaries meet and collide from all parts of the globe, none of the people who occupy this new cultural space originally "belong" there. In this way, nested and overlapping fields come into being in this new cultural space with various configurations associated with relatively weak and strong boundaries. One of the possible scenarios in the phase of neo-indigenous cosmopolitanism that you attach to Nicole's description of Caribbean identity describes solidarity around the act of resistance against the neo-indigenous group (newcomer). In this scenario neo-indigenous cosmopolitanism as a process and methodology renders

identities through the expression of increasing group affiliation mediated by the dialectical relationship between violence and affordance. This rendering is not unique to Caribbean identity. In fact, the power to subjectively create boundaries around social positions of difference often evokes a collective sense of belonging in many other groups. As such, neo-indigenous cosmopolitanism can serve as an entry point to engage in agency and resistance. The caution here is that any generalization that divides complex cultural processes into differentiated stages must take into account the shifting nature of the agency|structure and the agency|passivity relationships.

Being Beyond the Classroom: Engaging *Who We Were* and *Who We Are*

Rey: Passion, patience, and perseverance (3Ps) are my key ingredients for who I want to be. It is like a dream come true in looking at where I am now, as the passion to teach has always been in me since my primary grades. I grew up in a very poor family at a farmland located in central Philippines. I made it through my elementary years and set high academic standards for myself during high school. I managed to graduate as class valedictorian and was admitted to Silliman University (the only American university in the Philippines). At 19 years old, I earned a Bachelor's degree in environmental and industrial chemistry and started teaching undergraduate chemistry courses at the university while continuing to do research on environmental issues and problems. Our research group became controversial and politicians started to harass us; it was during these years when the environmental movement in the Philippines started to emerge. A year after I started to teach, I accepted a job offer as an environmental chemist financed by the World Bank. This kept me busy for the next 10 years. In 1986 after the civil war

broke out in the Philippines, colleagues in Washington D.C. made arrangements for me to attend the Water Chemistry Graduate Program at the University of Wisconsin-Madison. After I completed my graduate thesis, I worked for 5 years in a private environmental consulting firm working on environmental pollution control projects in the Philippines.

I decided to relocate to Riverdale, Bronx, New York in 1994 after my wife gave birth to our fourth child. For a year, I was a full time baby sitter to my four children. It was a difficult time for me to adjust to this new role since I was not used to doing household work. All I knew for more than a decade was doing environmental and laboratory work. Also, coming from a paternalistic society, there was this inner conflict developing in me allowing my wife to work full time as the “bread winner” and myself staying home. My babysitting job did not last for more than a year. I got so bored and decided to bring my youngest child to the Philippines so our relatives could care for him.

I came back to the U.S. to take care of my other three children who were in the elementary grades. This time, I started taking education courses with the plan of becoming a teacher. My three daughters whom I saw after five years of being separated from me seemed to have adjusted to their new home at Riverdale. We rented a one-bedroom apartment close to their school. They started making friends in the neighborhood and at many times, they arranged for play dates with their classmates. I made friends with their parents who were also immigrants and became actively involved in school activities. I watched other Filipino fathers doing the same domestic family work that I performed daily. During school days while waiting for our children to come

out from the school, we gathered at my apartment and talked about our experiences in the U.S. Some expressed self-pity about themselves, having good decent jobs back home and ending up babysitters of their own children here in the U.S. As more and more Filipino families came to the area, we became “one big extended family” and continue to share our hopes and dreams of making our lives better in America. We organized trips to Ivy League universities for our young children to see that what we dreamed of yesterday could be a reality to them in the near future. We were also active in participating in church activities. Almost all of us felt being responsible to each other that even church attendance during Sundays were checked. We finally formed the Filipino-American Families of Greater Riverdale Area. Our adjustment period was also confined to our own ethnic boundaries. We rarely interacted with the other races. Contrary to the experience of our children who socially and culturally adjusted so easily in their school, it took a little while for most of us (Filipino fathers) to feel comfortable with the other races, probably because generally as an ethnic group we are distinctively shy and do not even look directly at the eyes of others.

Eileen: My parents were Holocaust survivors from Poland and I was born in a displaced person’s camp in the American zone in Germany where we waited for five years before we could come to America. We came as immigrants from Germany to the Bronx in 1952. I attended elementary, junior high, high school and college in the Bronx and then was a science teacher in a Bronx junior high school and high school. Although I no longer live in the Bronx, my parents remained there, and my mom is still there at the age of 96. I have seen the Bronx go through many changes. As an immigrant there were many

struggles, particularly between parents and children, debating how to maintain culture from their place of origin while embracing new U.S. mainstream culture. Difference was also embodied by the material reality of housing and other sociocultural patterns. In the mid 1950's – mid 1960's I lived in the Crotona Park Section of the Bronx. The apartment building I lived in housed Italian, Irish, Puerto Ricans, and Jews. On the streets the children all played together, hanging out playing games, sitting on cars and annoying the grown ups, riding our bikes, but when we got together with our individual families, the friends we invited over were all of the same ethnic and immigrant background.

Children tend to form social bonds (affiliations) easily, and I remember wanting very much to fit in with the other children. Although my best friends were from families that were similar to mine, also from Europe, I wanted approval from the other children as well. I remember Chickie, whose family was from Puerto Rico, but who had been born in the U.S., making fun of our “green” ways. Among ourselves, the immigrants, we called ourselves “greeners” meaning we were new, we were learning the new culture in America, but we were still clinging to the culture of the old country. When I tried to dress like Chickie recommended, my parents were appalled. No big gold jewelry for me. Although our parents had made the move to America, they were reluctant to let us explore the many cultures America had to offer us because they did not understand them yet. Even school did not prepare us very well. I remember that in our classes at that time there were very few Black children, perhaps 10 in a school of 1000. If we interacted with them at all, it was only in school. We never played together in the streets. They lived a few blocks away from us, and that was a different neighborhood, and a different culture.

Nicole: I too am an immigrant, originally from the tiny cosmopolitan Caribbean island of Trinidad. Back home, my parents were civil servants and my family enjoyed the benefits of a typical lower middle-class lifestyle. In late 1993, my family of five migrated to the United States to improve my chances of gaining acceptance into an American college and obtaining financial assistance. We moved into the already cramped 2-bedroom, 7-member apartment of an uncle in northern New Jersey. I was immediately enrolled in the school that my uncle's step-kids attended. I remember those two years at my new public school in Jersey City very well, but these memoirs are not of my peers, not teachers, not classes. These recollections are mainly of the feelings of being the fashion-challenged FOB (FOB is an acronym for "fresh-off-the-boat" – a debasing label ascribed to recent immigrants). It wasn't that there weren't other first or second-generation immigrant students at my new high school, but it seemed like their nations of origin were everywhere else *but* the English-speaking Caribbean. These immigrant-students were mainly from Puerto Rico, the Dominican Republic, and from the Far East -India, Bangladesh, China and Vietnam. A significant majority were not fluent English speakers and possessed thick accents. I too had an accent, but I remember distancing myself from these students in an effort to more identify with 'normal American kids' who spoke English. Yet, I still didn't own any hip name-brand attire, any brilliant gold doorknocker earrings, or even enough money to eat out at lunch. These deficits were due to my parents' economic disability and their general disapproval of urban youth trends. I hated these shortfalls and their associated feelings of shame and self-pity. I quickly discovered ways in which to blend in as much as I could with the rest of the school population. I

secretly borrowed from a cousin's wardrobe to dress for school. My Trini accent became progressively weakened as I embraced 'American' dialect and slang. Almost immediately, this became problematic for my parents. They were strongly opposed to my siblings and I mirroring the ways of my uncle's step-kids who became 'Yankees' in the seeming blink-of-an-eye and adopted most, if not all, of the 'bad American ways'. What was I to do? Remain ostracized at school and reject assimilation in an effort to retain my culture and satisfy my parents? Or do I defy their wishes and Americanize to garner some much needed social capital to maneuver eleventh grade? In retrospect, I theoretically did both. I readily identified more with being a Black (American) kid when I interacted with other non-immigrant Blacks. On the contrary, when I engaged in conversations with other Caribbean immigrants, I enacted more of my Trinidadian culture – language, mannerisms and topics of discussion. Our few similarities fostered the creation of a pan-Caribbean identity and it was the latter group that I more closely befriended. Consequently, and un-consciously, I had quickly familiarized myself with the benefits of aligning with an identity dependent on whom I was conversing with. That is, I became increasingly adept at utilizing particular parts of my own cultural capital in order to afford my entry into special circles to ultimately garner much desired social capital (Tobin, 2005).

Wesley: Nicole and Eileen referred to metaphors used to designate cultural location and immigrant status. Eileen mentioned how newly arrived immigrants were labeled "green" or "greeners" representing the status (symbolic capital) of not being able to navigate their new ecological (and cultural) terrain. Similarly, Nicole refers to being labeled as "fresh of the boat" (FOB) and not being able to gain symbolic and social capital because of her

asynchronous style of dressing associated with her new peers. Nicole and Eileen faced new youth cultures. Other metaphors attached to immigration and "newness", such as Haitian boat people, are often derogatory labels - even labels given to African American by Caribbean Blacks such as "Yankee"-that persist in local and global conversation. Labels like "Yankee" and "Nigga" that were born in oppressive and colonial relationships and images of the past are inscribed in cultural enactment and metaphors of the present. The metaphors become ways of othering and highlighting differences. What strikes me the most about these metaphors is that they define a modality that sets the rules of engagement (Lakoff & Johnson, 2003). Similarly, Rey describes his 3Ps (passion, patience, perseverance) metaphor as being embodied in his agency to bring about success. Within metaphors we see the tensions in the agency|passivity and agency|structure relationships. As such, metaphors that we live by help structure schema and practices embedded in encounters in a manner that challenges our lived experiences (e.g., the condition of sameness attached to difference).

Chris: I would like to challenge both Nicole and Eileen to revisit their experiences as newcomers/immigrants from the stance of the incumbent where others were the newcomers. In other words, it would be valuable to look at the process of assimilation into some type of norm and then view the way that they have interacted with newcomers. When Eileen discusses her experiences as newcomer with her friend Chickie, she focuses on her stance as newcomer but doesn't trouble the fact that she has become the veteran who has had interactions with newer immigrants who can then be viewed as the newcomer. In Nicole's example, and her discussion of non-acceptance because of her

attire, it would be interesting to investigate what happened when she began to become accepted and how she interacted with newer immigrants who came into contact with her. I argue that by viewing past experiences through this lens, we develop an opportunity to understand where the naming as “green” or “fresh of the boat” come from. When Eileen or Nicole have become accepted or have become comfortable in their own skin, how have they “played the game” they experienced? Wes touches upon this issue in his response above and sets the stage for further discussion of the dynamics at play when the newcomer and the incumbent interact with each other. Wesley’s attempt to push the envelope in the discussion by pointing to the othering process that takes place when there is a naming of the newcomer helps to set the stage for this discussion.

Questions about the rules of engagement begin to start the necessary discussions here. How and why does the naming of the newcomer as the other occur? Why does acceptance as the newcomer surround one’s possessions or appearance? Why was the wearing of the hoop earrings or the designer clothes such an important part of the acculturation process and did acceptance also mean a change in understanding and thinking? I argue that the othering process that both Nicole and Eileen experienced may have been replicated on some level in their experiences with others. I would also argue that the acceptance of their peers was marked by physical appearance but that it was just a piece of a shift in understanding and thinking that becomes necessary for acceptance.

Nicole: Chris, I think you raise some provocative questions and I would like to offer a response based on my own personal experiences. I agree that it would be highly

interesting to investigate the transition of newcomer to veteran immigrant. Such an examination will help us to more deeply interrogate the factors that enabled this transitioning and allowed a removal of the immigrant label. However, I believe that this did not occur in my narrative. Even after spending two years at my new Jersey City high school, I maintained a semi-alien status with the school body. My junior year was spent almost entirely in a state of cultural shock and in my final year, even though my attire became more contemporary, I remained one of, if not the only student navigating the school hallways with a Trinidadian accent (there were larger numbers of Guyanese and Jamaican immigrants). In addition, I was the sole Black student in the magnet program in the graduating class. Therefore, in many respects, I entered and remained the other. Due to my placement in this program where all my classes were taken with the same students and additional responsibilities both in and out of school, I did not come into contact with any other new immigrants. I subsequently left the school and then attended an undergraduate institution where being an immigrant was the norm as a large portion of the student body were either first or second-generation or they were international students. This was especially true for the Black and Latino/a population. I would argue that the existing population that a new immigrant becomes immersed into is critical to the assimilation process of this newcomer.

At my high school because there were fewer students from my native country, the feelings of being the other were intensified and thus there was a greater desire to fit in as quickly as possible. The exact opposite was true at my university. Due to the significant numbers of immigrants from all around the world, and a sizeable group from Trinidad,

there was almost a halting of assimilation. Despite being at different stages of acculturation, we accepted each other and thus, there was little need to change to try to fit in and belong. In some cases, veteran Caribbean immigrants began to exude behavior of newer immigrants. Increasingly, they used native dialects from their perspective countries, spoke about favorite dishes, music and other traditional customs. Solidarity, a form of symbolic capital, grew from our social networks that produced positive emotional energy and coherence in traditional Caribbean practices (Tobin, 2005). This sense of belonging that was produced within the community also extended to both freshman and transfer Caribbean immigrant-students as they were eagerly welcomed into the family and mentored during their first year. In retrospect, I acted more like myself when I entered this post-secondary setting, and this remained true for my entire stay at this institution. In a sense, there was a renewed embracing of my native culture based on this unique circumstance. I feel that the phenomenon Chris has alluded to (replication of othering by veteran immigrants) is situational and will occur in particular circumstances, the premise of which I have begun to outline. If there existed a larger Trinidadian population at my high school, my experiences there would have been entirely different. However, I am in accord with his last remarks about new immigrant-acceptance being more intimately connected to the adoption of more mainstream ways of thinking and understanding. The mere fact that my attire became more up-to-date as time went by was by no means a marker that I had been formally embraced by my American peers. Even though they may have interacted with me in seemingly 'normal ways', this did not mean that they did not speak of me or continued to regard me as different and still as the other.

As explained before, my immigrant experience was partly unique due to my age, the student body I entered and the time spent there.

Eileen: Chris's question of how and why the naming of the newcomer as the other occurs is interesting. I believe that the immigrant names herself as the other, just like the mainstream community. I agree with Nicole when she discusses Chris's remarks about the new immigrant-acceptance being more intimately connected to the adoption of more mainstream ways of thinking and understanding. Because I came to America when I was three, I did not speak with an accent. I was White, so I was initially indistinguishable from the predominant groups of people in the neighborhood who were also White. As I grew older I learned not to wear my hair in braids, and not to wear the immigrant-type clothes my mother picked out for me. In kindergarten and the early elementary years, I felt most like the other. Unlike Nicole, however, when my attire became more up-to date, I think I *was* more formally embraced by my American peers. My parents embraced being the other and encouraged me to do so as well. Once I got into the upper elementary years, if they still regarded me as the other, I tried not to feel it. In class, I fully embraced being an American. At home I fully embraced being an immigrant. I still only speak "mamaloshen", Yiddish, with my mother. On the outside, I appear totally American. On the inside, I make myself an other.

Chris: I certainly agree that the nature of the relationships between a newcomer or veteran/incumbent member of a social group is affected by multiple dynamics. Factors such as the standards of what is classified as the norm and the newcomers' closeness to that norm, the time one has spent in a specific social field, and the multiple fields within

an existent one and beyond it that one must navigate are always important. My point in the last entry was to shift the tide of the conversation from an explicit focus on our perspectives as the newcomer (with whatever experiences that come from being the newcomer) and include our perspectives as individuals who are constantly shifting and maneuvering within social structures and “learning the ropes,” which often means living or learning to survive within an oppressive structure. My challenge to look at how we replicate the othering process is not presented as a move to dismiss or diminish ones experience as the other. In fact, I argue that ones experience form newcomer to veteran does not signify a removal of a label of immigrant or the other. Rather it (interrogating how we replicate the othering process) is a push towards examining how we replicate this process in some form in order to re-examine how it is imposed in the first place.

To argue that we do not necessarily replicate the othering process may come with a singling out of a single experience or field without factoring in how the one single field functions in a network of other fields. For example Nicole, in your experiences in college with the Trinidadian community, you present a scenario where both newcomer and veteran engage in a form of mutual respect and admiration for each other because of their ties to their land of origin. You also explain how this occurs among other immigrant populations from different countries in the school. In the larger field (the university), where each of these nationalistic groups lie, the insularity of the groups based on nationality create a social structure where each group views and values itself as the norm and everyone else as the other. The relationships among groups are then affected and the process of othering plays out in this case on a larger scale (and enacted by individuals

from each of the groups). Anderson (1983), in an exploration of nationalism and the power of imagined communities that surround an idea of solidarity around the nation speaks to the distancing from, perception of, and eventual violence towards an other based on their nationality. Even on a global scale, the relationships among nations can be perceived through the lens of a looker and an other. The exploration of this dynamic provides deep insight into how the newcomer immigrant experiences being the other. Your transitioning among multiple social fields within the school and the complex dynamics that come with multiple border crossings definitely seem to have an impact on whether or not you felt accepted and may have made you feel like you were always the other and never accepted. However, the point remains that at some point you experience being the other and on some level, you perceive another person as other. The scale at which this is perceived varies and the implications of being the other in different fields vary as well. Perhaps the lens that your parent used to view your Americanized cousins or your experience as a Trinidadian student who looked at other groups as different can stand as examples. However, dismissing the existence of this dynamic would equate to looking at the process of othering purely from a perspective of the other and would make it challenging to thoroughly investigate how the process expresses itself in multiple social fields.

The point about attire and clothing made earlier was raised to bring up the exact point that you made in your response. Clothing and attire are usually used as a marker for being from a specific class or group but does not necessarily mean that one has gained acceptance into the group or has fully understood the culture of the group. This plays out

in contemporary discussions about hip-hop culture and many populations that dress in ways that look like urban American youth or hip-hop artists but that have no idea of the complex dynamics that come with being a part of hip-hop culture (although some do). For some parents, the youth that copy what can be described as urban hip-hop attire are trying to copy the other. In the case of immigrant students, parents fail to realize that they may be just trying to fit in.

Eileen: Nicole, it's interesting that several decades later, and coming from different cultures we felt similarly about fitting in and dealing with our parents. I guess this is something all immigrant children will face. I think that the early 1960's was a pivotal time in changing the Bronx. I was in the Bronx when CO-op City opened in the northern Bronx near Westchester in the 1960's. It offered a place in the northern Bronx for those in the Bronx who could not afford or didn't want to move to Riverdale or the suburbs. The numbers of Puerto Ricans and African Americans who had been living in the Melrose, Morrisania, and Crotona Park East neighborhoods had been increasing, and Whites were anxious to move out of those neighborhoods. Suddenly the South Bronx was heavily Puerto Rican and African American, and the Northern Bronx mainly White. The racial and economic composition of public schools in the Bronx changed drastically. Veteran teachers in these schools were unprepared to deal with the new students coming into their schools. It would take several years and a new crop of activists that entered the urban schools as a way to escape serving in the Vietnam War to make any changes. One way men were released from service in Vietnam was to serve as a teacher in an urban school in certain neighborhoods. I became a science teacher at Taft High School in the

Bronx in 1969 right after the big strike. I began teaching in a school and a system that pitted teacher against teacher (those who crossed the picket line and those who didn't). In addition, as Wesley mentions in Chapter 2, the public schools became a reflection of the neighborhoods they were located in. Taft High School had been a school of White students and White teachers that became a school of White teachers and a student body composed of mostly Puerto Ricans and African Americans. This happened within a span of a few years in the late 60's and early 70's. I began teaching in a school that also pitted culture against culture (White middle class teacher against African American and Puerto Rican student).

Wesley: Eileen's reference to the Vietnam War (1960s and 70s) is timely and extremely salient, since the Iraq War (Gulf War 2) is presently occurring. The Gulf War is at the forefront of national and global conversations. Global and national policies that do not speak directly to education often have potent implications for education. Eileen mentioned how the Vietnam War had increased the number of males entering the teaching work force in the Bronx. Males, particularly White males, became teachers in the Bronx high schools to avoid being part of the draft. Black males were less likely to take advantage of this option because on average they were less likely to be able to pay for college (a key requirement to becoming a teacher). Many of the White males that took this option were from the Midwest and ended up teaching in rural and urban communities of color. Although there is not an official draft currently associated with the Iraq War, there is an unofficial draft (in my opinion) occurring in urban (inner city) schools. Not only has funding been diverted from schools to the war, but the recruitment wings of the

armed forces have become an occupying force in inner city schools and schools throughout the US (Spring, 2006). According to the No Child Left Behind Act of 2001, schools receiving federal funding must supply military recruiters with student contact information when requested to do so. The only exemption is when parents write an "opt out letter " forbidding the release of their children's contact information to the military. As such, discussion about the war saturate and structure encounters in many schools. Fred Erickson (1998) points out those topics driving global conversations are appropriated and used as recourses for local conversation. Later in this chapter, Rey Llena describes a situation where he rebuked students for not doing their work by telling them that they might end up with no choices but to enlist and serve in the Iraq War. On the other hand, the sophisticated recruitment commercials infer that the relevant education must support the careers positions in the army and that if students are not getting it in school the army will provide the necessary training.

Nicole: Wes brings forth truly provoking points about the issue of military recruitment in urban public schools. At this point, I would also like to inject into this discussion another interesting phenomenon. Sadly, NYC based literature confirms the paradoxical trend of increasing diversity and yet continued segregation between groups (Hum, 2004). Despite the large waves of migrants to the NYC area, ethnic and racial groups continue to carve out their own neighborhoods in each borough of the cityscape. We find Blacks in Harlem, Italians in Bensonhurst, Dominicans in the Bronx, Orthodox Jews in Williamsburg etc. As Wes points out on page eleven of chapter 2, the immigrant experience is completely nestled between difference and sameness. Immigrants seek

sameness by settling in certain neighborhoods or similar cultural centers. Within these enclaves, their communities are strengthened by a solidarity that is formed through the social networks that facilitate their economic mobility and community life. However, when different groups encounter each other in public spaces, the differences take center stage and foster an environment where sentiments of hostility brew and groups become competitive. You can read countless literature that plays up the rich history of NYC and how the city grew to become a great cosmopolis. However, the unfortunate truth is that it may be far-reaching to expect or demand an immediate acceptance of difference in the classroom when it doesn't even exist on your block in Brooklyn. Have you ever ventured into a neighborhood that wasn't quite similar to your own, felt the stares and witnessed the perplexed faces that questioned your presence? We boast about being really diverse but in actuality, we are extremely intolerant of each other. The average individual would proudly embrace diversity in his or her neck-of-the-woods, as long as it is situated a couple blocks over and they could readily choose to visit it when they felt adventurous. In other words, it's the "I love rice and beans" declaration but "I damn sure don't want those loud Puerto Ricans moving next door" that's problematic.

Chris: Nicole, your descriptions of the sameness and difference argument, speak to the nation-ness that develops within insular communities that close themselves off to other groups. In my previous response, the same dynamic that you describe when groups come into contact with each other and hostility brews is similar to what occurs in a situation like the college where different immigrant students form insular nation focused groups. At some point, they begin to perceive themselves as the norm and others as other.

Focusing on these moments provide a lot of information about how the othering process plays out on multiple levels.

Wes' comparisons between the Vietnam and Gulf wars and the collateral effects of these wars on the Black male and their ability to participate fully in the American work or education force are very insightful and accurate. These observations tie back to the power of stereotype and what Fanon describes as the "epidermal schemata" that comes from being Black (encompassing a phenotypic Black sameness of people from different ethnic backgrounds) as perceived by those other than Black and the consequent negative inscriptions on the Black identity. Social structures that inhibit the Black male from being fully engaged in the work force or in higher education are then downplayed despite the fact that they feed negative stereotypes about Blacks.

Science Teaching: Knowing Passion, Patience, and Perseverance

Rey: It was not that easy to obtain an entry level teaching position in New York City. During a panel interview, I overheard two principals arguing whether or not to accept me, doubting my ability to handle students with behavioral problems. After the interview, I spoke with the hiring principal and assured her that the school's investment in me would not be an embarrassment or a failure. I started my first year of teaching 1995 at the High School of World Cultures in the South Bronx. I was assigned to teach science and math to ESL students from Eastern Europe, Latin America, Middle East, Africa, and Asia. In collaboration with community organizations and government offices, I employed project-based approaches to teaching. At one point, we used video cameras to record students' presentations. I asked the students to present their projects using their own native

language and translate the whole presentation to English. After five years teaching at the High School of World Cultures, I transferred to Gorton High School in the Yonkers school district. This was the most challenging. I was given all classes of at-risk students (30 students in a class) with all sorts of behavioral problems. Most of the students were repeaters. I was also teaching an afternoon academy science class designed for those students who did not have enough science credits to graduate. In these types of classes, behavioral problems were commonplace. There were many occasions when I had to bring a tape recorder to document how unruly the class was. There were students who were just out there to disrupt the class to make our lives miserable. There were students who showed up once a month. There was also no sanctity of the test anymore. Students openly cheated during exams. At one point, I decided to show how angry and frustrated I was about the whole situation wherein learning was not taking place in the classroom because of the presence of a few hopeless and misguided students. In a very dramatic move, I started breaking all the pencils in front of the class and made it clear to them that I meant business in my classroom and would not teach if students continued to disrupt the class. I made it clear to the students that I cared about them and my main goal was to equip them with scientific tools so they could be good decision makers. “Who knows, some of you will end up in Iraq”. This was my last warning and started giving zeros to those who did not even copy the daily aim on the board. I learned to swallow verbal abusive racial slurs. I ignored name-calling, belittling myself as their teacher since all these students were also minorities.

Eileen: My first day as a science teacher in a Bronx high school was an experience. My chairman told me to make sure to lock my door. It was in an area that came to be known as Fort Apache which Wes describes on page 27, paragraph 1. I had 40 students in a class and not enough seats. I was advised not to send kids to the bathroom, because to open my door would expose the students and me to intruders. The bathrooms were particularly dangerous places in our school. The teachers volunteered their time to monitor halls when they had a chance, but the students were reluctant to have the bathrooms monitored. In the previous section, Nicole mentioned the differences that can take center stage when groups encounter each other in public spaces. School is a public space. In the Bronx these conditions helped gangs to gain a better stronghold. The veteran teachers were bemoaning how good a school this had been, and how the new students (African American and Puerto Ricans) had spoiled it. The new teachers were excited to be there and hoping to make changes in the culture of the school. We had some chances because the veteran teachers (who should have been helping us) just wanted to be left alone. They were out the door when the bell rang at the end of the day. This school had been the one of the top schools in the Bronx. Discipline had never been a problem, and the veteran teachers just wrung their hands in despair. These teachers directed intense negative emotions towards the students and teaching. I still today remember how I felt as I listened to these veteran teachers as I was trying to form my identity as a science teacher. They were part of the problem, not the solution.

Wesley: Eileen and Rey, I wonder how you were able to build and develop your identity as a science teacher during the initial stages of your career. In many ways, these scenarios

still exist throughout the NYC public school system. I maintain that part of what happened with the teachers you describe above relates to identity. Each time you enter the classroom and begin to teach and do science (albeit consciously and unconsciously) you continue to build and rebuild your identity as a science teacher. When you traverse field boundaries, you enact identity mediated by the agency|passivity relationship, however, you do not leave the schematic residues of culture and identity that you have appropriated behind. Identity and culture are in part historically constituted and are available as stocks of knowledge at hand. There are more stable and changing parts of identity. So that from day-to-day you still identify as Eileen utilizing your more stable (core) parts of your identity (i.e., I am female, a good person, caring..etc). When core parts of you identity get challenged (e.g., some one accuses you of being dishonest or a thief), you may act strenuously to counter the challenge because it threatens your core identities. For instance, it seems that Rey's identity as a good classroom science teacher was being challenged during the interview he described above. In that situation, writing his identity became high-stakes. Similarly, when the teachers Eileen referred to wanted to be left alone, they did not want their identity as good teachers to be changed or challenged. Since they were veteran teachers, identifying as good teacher was probably part of their core identity. As such, challenging the teachers she referred to or asking them to challenge themselves to come up with alternative ways of being good teachers associated with the new population of students might be viewed (consciously|unconsciously) by them as an attack on their core identity. This challenge may elicit a culture of resistance that is described above by Eileen. Racist attitudes (schema) displayed in discriminatory practices in the classroom towards students are also

schematically attached to different parts of identity. The individual does not only create identity, it is also inscribed by the collective other. Consequently, social (and symbolic) violence tends to get enacted when these two associated spheres of identity are not coordinated. Identity is also at play when, as Richard Valencia (1997, p. 8) notes, "many adults who develop educational policies or teach students attribute school failure to students, and school success to themselves."

Rey: I began to build my identity as a science teacher during my teacher education program. Prior to applying to a teaching job in the New York City public school system, I took several education courses that included: psychology applied to teaching, methods of teaching mathematics and science in secondary schools, and multicultural education. During this progress, I conducted my student teaching at Dewitt Clinton High School, a comprehensive high school in the Bronx. I was very confident that I would be able to create a science classroom that was more engaging to students with my training and experience as a practicing scientist for over twelve years in the industry. The big issue I had was how to ensure that learning would be taking place in my classroom knowing the challenges teachers have been encountering in most classrooms in the Bronx schools. For five years, I think I was just fortunate to have taught high school students who were also new immigrants in the Bronx. We were all adjusting to our new school environment. Although I did not experience a lot of discipline problems in my classroom in those years, I attended more than twenty different workshops during my first year of teaching on areas dealing with lesson planning, handling students' behavioral problems and technology related training. In addition, taking more education graduate courses

helped me develop a better understanding of the complexities of students' lives from different ethnic backgrounds. I learned to be more patient while listening to students explain their difficulties in grasping abstract chemistry concepts. As time went by, I tried to use technology to translate abstract concepts into more concrete visuals.

I also felt that passion, patience, and perseverance (3Ps) were part of my identity and I used these three concepts to build my identity as a better science teacher. I used my 3Ps to become a better science teacher at Gorton High School. As described above, the classroom environment at Gorton High School was extremely challenging for me. I managed to control myself and continued to use positive reinforcements especially to those students disinterested in learning science. I continued to be very strict in checking notes and using questioning techniques heavily from that time on. I used peer pressure strategies using "friends of the foe" techniques to reach out to those disruptive students. I concentrated my energy in helping those disruptive students complete their work and when I found the right moment, I praised them for jobs well done. I started making friends with them and kept telling them of my hope for their success after they finished high school. I realized that it took so much energy and patience to become a real teacher. My identity as a science teacher grew to be more of a compassionate stage actor wherein everyday I had to rehearse my scripts to produce what I regularly visualized as a successful and engaging learning experience in my classroom. Such practice was so exhausting physically and mentally.

Nicole: The veteran teachers Eileen described above are indeed part of a problem that continues to plague public schools around. Black and Latino/a students and their immigrant communities continue to be scrutinized with a deficit lens and branded accordingly. What is interesting is that dissimilar racial immigrant groups are also differentiated with schools ascribing certain negative or positive characteristics to these groups. For example, there are many teachers who wholly assume that Asian immigrant students will lead the pack of achievers in their class. Likewise, these individuals also assume that Black and Latino immigrant students will behave disruptively and perform poorly like their American-born counterparts. When I attended public school in Jersey City, I experienced the same phenomenon. My high school was large with an average graduating class of over six hundred and a home to students from a plethora of racial and ethnic backgrounds with each population fairly represented. It was also a magnet school with less than five percentage of the school population enrolled in this specialized program. I was one of these students, and the only Black face amidst a sea of Chinese, Indian and Filipino high-schoolers. I received the cold shoulder from many classmates, who questioned why I was allowed a place in the program. There was even a "covert mission" to thwart my being named the class salutatorian. They argued that I didn't attend the school for all four years and that I hadn't participated in the annual science fairs in the school district. Unfortunately for me, they retracted the honor and I was left to settle for third rank at graduation. The sad truth was that my really diverse new home of immigrants still could not accept a fellow Black immigrant excelling in the sciences. This circles us back to the unfortunate underlying premise that school systems (and people in them) continue to bestow deficit perspectives on certain immigrant groups. Why on

Earth is the cultural miscellany introduced by immigrant children rejected, and not regarded as a tool with which to foster and strengthen learning environments where difference is valued, and multiple perspectives are seen as essential to knowledge construction and true learning?

Chris: In response to Nicole's question, I propose that that the reason why immigrant children's cultures are not used to foster the traditional learning environment has to do with the stereotypes that are associated with the students' backgrounds. Certain students' cultures are perceived not to align to the norms of the school and consequently, the school chooses not to accept their cultures. A student who is new to a school is judged as soon as she enters by her appearance and color and is classified as either intelligent or incapable of learning based on her appearance and how she does on a few tests. If she takes a few exams and looks and acts "appropriately," her culture will become valid for further interrogation or discussion. However, if this is not the case, her culture is classified as being in opposition to school. In a recent paper, I discussed allegiances to either corporate or communal approaches to teaching and learning that serve as a tool through which individuals are often classified within school settings (Emdin, 2007). In spaces where the corporate way of teaching and learning is the norm, students' cultures are assigned to being either right or wrong based on the closeness of the student's perceived cultural allegiance to a corporate or non-corporate approach to education. Caribbean students are often perceived as model Black students because of the fact that their experiences in a British, post colonial education system aligns more closely to corporate approaches to education than the communal approaches to teaching and

learning of many African American students that come from a post-slavery, communal based schooling system. The dynamics between African American and Caribbean students are often complicated by the students' color. Consequently, Caribbean students who may align to the corporate approaches to teaching and learning are stereotyped in the same group as African American students and not allowed to exhibit their culture that in many times aligns to the corporate school culture. In Nicole's example (her not being allowed to be the class salutatorian), her experiences as a Caribbean immigrant who succeeded in school but wasn't accepted by her peers shows the complexities of a student's phenotypic grouping and consequent stereotyping as Black despite her closeness to the school's corporate ideologies and the misinformed stereotypes that being Black meant not being able to perform well academically.

The power of stereotype in this discussion is understated and should remain as an underlying theme throughout any discussion that involves immigrant students in schools. It is important to recognize that there are stereotypes about students that come from the school but that there are also very powerful stereotypes that come from other students. In both cases, there is a convergence of attributes to particular individuals that carry over into how they are perceived in academic settings. Much of Frantz Fanon's (1967) work interrogates the postcolonial condition that causes many generalizations that become embedded in the psyches of both the person that puts the stereotype forth and the one that is the focus of the stereotype. In this work, he describes an example of a structure that says "you are rich because you are White" and that being Black means being a brute, animalistic and unintelligent. I argue that a similar process occurs when Black becomes

synonymous with unable to achieve in school, disinterested in school or being undeserved of recognition for academic success. These same types of stereotypes are associated with where people come from and their neighborhoods.

Wesley: Chris, I find Fanon's work very insightful. Fanon posits three stages that describes the interaction of the colonizing power with the colonized (target population): at the first stage the colonized identifies with the colonizing power; the second stage finds the colonized attempting to reestablish ties to traditional culture; at the third stage the colonized asserts a revolutionary and nationalist position against the colonizer. Fanon admits that these stages are not discrete and must be further nuanced to help explain complex social processes. In addition, these stages may not occur in sequential order. Within this framework, Fanon argues that colonialism and oppression distorts, disfigures and destroys the past of the colonized with racial and national stereotypes. Accordingly, stereotypes create imageries (distortion, disfiguration, and destruction) of differences as real in order to construct the other. These stereotypes often create and blame radicalized minorities for a perceived lack of certain qualities and inability to understand and solve their own problems. The tendency to blame the other provides a convenient excuse not to examine systems and institutions that function to create marginalized groups. Racial and national stereotypes are integral aspects of deficit thinking. Stereotypes, like deficit thinking models, aim to provide description, explanation, and prediction projected at target populations. Deficit thinking moves beyond stereotypes by positing maintenance of deficits even when prescriptive approaches are deployed. Interlocking stereotypes embodied in discriminatory practices reveal underlying patterns of racial privilege along

with racial and ethnic stereotype differentiation. Nicole describes the situation she faced as a first-generation Black immigrant excelling in science in her high school. For Black Americans and immigrants in the U.S. skin color (phenotype) automatically and unconsciously activates racial stereotypes. As a rule, Black immigrants are subjected to the same race biases and discrimination as Black Americans (Tormala & Deaux, 2006). Tormala and Deaux also suggests that in situations where individuating information is available, Black immigrants are positively stereotyped from African Americans by the White mainstream. Caribbean culture and associated family relationships are described through different routes and value systems to provide a rational for differentiated stereotyping. These positive stereotypes are often manifested in arenas of employment and education. White employers show their preference for Black immigrants over African American which ascribes to the notion that Black immigrants have better work ethics and interpersonal skills. In the educational arena first-generation Black immigrants tend to graduate high school and matriculate at colleges and universities at a higher rates than Black Americans. Within the Black immigrant student demographic generational differences in academic performance are evident. Building on the work of Claude Steele (), Deaux used the notion of stereotype threat to illustrate that second-generation Caribbean students show significantly decreased academic performance relative to first-generation immigrants when stereotype-threat conditions of Black inferiority were invoked, but performed equally when they were removed. As Fanon argues, negative stereotypes of one's own group expressed by others may reflect back and become internalized and incorporated into the construction of self-image. In other words, the network of contradictions associated with stereotypes exploit the complexity of the social

and historical meaning of the construction of Blackness. To address Nicole quandary, immigrant children who are not Black may themselves buy into stereotypes projected into the national and global popular imagination associated with Black people. It is possible that Nicole found herself inscribed as a Black female first and immigrant a distant second by the individuals and political structure she encountered in her high school.

Nicole: I agree that negative stereotypes have had a powerful impact on how Black students are treated in the classroom. What is interesting to me is that adults do not solely commit these injustices against children, but they often treat other adults in the same grain, as do children do unto adults. Rey, your narrative illuminates numerous examples of this. You spoke about how you were regarded and subsequently treated by some individuals in the Bronx school system as well as the verbally abusive slurs you endured from students. It is saddening to hear that despite your impressive qualifications and commitment to the teaching profession that you had to deal with such atrocities. In spite of your education and professional experience, sadly, your being an Asian immigrant overshadowed all. Your accent and appearance (phenotype) are the primary indicators of this, attributes that you cannot mask and unfortunately you were judged and labeled because of this. When I first started teaching five years ago, I also felt that they, the school administration, deemed me in a diminished light. I was offered a science position at my current Manhattan private school in mid-July that year. I was offered a Chemistry and Life Science position on the spot as they were in desperate need to replace a last-minute non-returnee instructor. I too was desperate for a job after being recently turned away by the NYC Board of Education. My school is predominantly White, small, fairly

conservative and governed by a strict British headmaster and wife team. When I was hired in 2003, I was the only Black female teacher on staff. I was extremely nervous, not about my ability to do the job, but about the perceptions the rest of the staff and my students would have of me. However, taming my wild curly hair and adopting a temporary American accent from 8 to 4 were not options for me. I told myself (and also revealed to my science chair that year) that I was not going to conform nor morph into the stereotypical middle-class Black. I was adamant that I was going to remain true to myself, educate my students about my Caribbean culture and experiences and aim to garner acceptance that way. Five years later, I must say that I have never deterred from this plan, nor generally encountered any obvious negative ascriptions from students or teachers alike. My headmaster highly values my abilities partly because of my British-based primary and secondary education. He, along with other faculty and students, continue to regard me as a central science teacher because of my American Ivy League education. Therefore, even though I am clearly the other in my building, there are circumstantial factors that have fortunately allowed me to maintain parts of my core identity while being generally accepted and respected by structure I work within.

Eileen: During my first semester at Taft High School in the Bronx I applied for an NSF grant at Stanford University. They were having a three-week summer institute on ways to help inner city disadvantaged youth learn science. Although the title shows inner city youth through a deficit lens, “disadvantaged”, the lessons I learned during that institute stayed with me my entire teaching career, and they were not deficit ideas. Lab work was encouraged, as was positive reinforcement and cultivating a passion for teaching.

Whenever I heard the negative comments from my fellow teachers from then on, I was able to balance them and counterbalance them by remembering the experiences I had at that NSF Institute. It gave me the courage and determination to be a caring, successful, empathetic science teacher. In all the schools I have taught at since, other teachers have come in to observe my classes, especially when I am running a lab. In *Improving Urban Science Education* by Tobin, Elmesky, and Seiler (2005), they argue that practices are historically constituted. I believe that beginning exposed to non-deficit ways of teaching and learning science influenced my teaching practices and me. I brought that initial NSF Institute into my future teaching practices. Every student has a job in the lab session, and all are expected to turn in a report, whether as a group, or individually. And they do. It might not be “A” quality work, but it is completed and they are appreciated.

Rey: During summer of 2005, I applied to seven small schools and got interviewed for a chemistry teaching position. Of particular interest was the NYHS for Health Professions in the Bronx. I got interviewed by the hiring committee at 8pm and was offered the job the following day. I describe my teaching experience at NYHS as the realization of my changing perspective about effective teaching and learning. The small school environment coupled with supportive administration, and staff has enabled us to do educational research on coteaching and cogenerative dialogues. My involvement in the research work as a teacher-researcher has energized me to keep on thinking how else I can motivate my students to achieve more. It is through this research that I conceptualized and introduced the “Academic Buddy System” wherein students take responsibility of “*being with*” their assigned buddies. Together, they developed a strong

bond for respect and appreciation to each other as manifested in their pronounced emotional energy as I watched advanced students teaching their assigned academic buddies without being told. Participating in cogenerative dialogues helped to transform both the students and me into more responsive and active learners. The team effort in each teaching and learning activity has created a positive tone in the class which has provided the “hook” among students to academic achievement. In the classroom, one sees a student teaching other students most of the time. Among students groups, there is always great interest in who will present first and which group will be assigned as the evaluator of the presentation. In addition, students observe (in action) their teacher coteaching with university researchers taking place. In many occasions, coteachers modeled to the students that teaching is a collective responsibility and we were there reinforcing each other to maximize their learning. The use of video cameras to document classroom activities was such an effective tool in further assessing what needs to be done to improve the different interactions that transpired.

Wesley: I began teaching in what you might call a hybridized environment at City College of New York - a very similar one to the current College Now model at CUNY. The course was an advanced chemistry class for high school students who passed the Chemistry Regents, but who needed to score higher on the exam and wanted to get additional exposure to college level work. Most of the students were interested in pursuing a science or health career. I did not teach to any standardized test, however, I shadowed the CCNY syllabus for freshman level chemistry. The course lasted for two semesters and the grades the students received were placed on their high school

transcripts. The program drew primarily underrepresented minority students in science, particularly Black and Latino students, from a variety of inner-city schools across NYC. Teaching in the program provided me with a snapshot of the students who were preparing to enroll in college level science programs. After several years of teaching the course, I noticed some disturbing system-wide trends. There were high schools that for year after year, sent students to our program with clearly inflated grades and portfolios. Other schools elected to send only Asian students, who are traditionally over-represented in science careers, despite having a large population of Black and Latino students, who are traditionally underrepresented science. The first time I taught the course, I encountered some resistance from students who felt that I was too young to be teaching such a course. I remember one student recognized me because we lived in the same neighborhood and said he saw me at a block party. In order to "prove myself", the senior teacher in the program advised me to purposely give difficult exams so that students would invariably earn low grades. I did do as he advised once, but quickly realized that using such a tactic would bring fear to the students and this was not the type of culture that I wanted to build in the classroom. Now, I understand that those types of tactics are a form of social violence. The following year I took a different approach and spoke with the students on the first day, sharing my background and hopes for the class and encouraged the students to do the same. We even formed a "chemistry rescue squad" where students were able to call me or other students in the class to get help when they were stuck with homework assignments. Even though those sets of experiences happened approximately 10 years ago, I still encounter similar situations today. Recently, a colleague introduced me to a cohort of middle-aged college students of whom I was scheduled to teach in the

following semester. After, he introduced me and encouraged the students to ask about my plans for the fall semester, the primary questions the students asked related to authenticating my academic background and professional credentials. A general/unanimous sigh of relief was heard, followed finally by one of approval. Without an utterance, it was understood that I had what it took to teach the course. I noticed that my colleague, like me, a young Black male, looked annoyed because we both sensed the subtle stereotyping that was being projected. At least from prior experiences I know that implementing communal structures, such as cogenerative dialogues would be necessary ingredients to building community in the class during the fall.

Chris: On the first day of school, I stood in the front of a science classroom that had 58 students because of a scheduling error and was told to start teaching. As I began to introduce myself to the students and tell them about myself, one of the students recognized me from the neighborhood basketball court and asked how it was possible that I was a teacher. The students were also just as surprised that I was teaching math and science, as the district personnel were when I walked in to apply for a job. I vividly remember one of the students saying “But you’re Black?” in astonishment. My experiences on that day and in the school in the following weeks caused me to be committed to teaching science in urban schools. I had not realized that my being a young, black person who had a degree in the sciences and was teacher was such an anomaly for the students. I realized that the students’ experiences within the school and outside of the school had both supported a stereotype about urban youth of color that did not support being able to be successful in science. I was able to show students that they were able to

be successful in science and mathematics. My goal for the school year was to show students that I was just like them and that they could do greater things than I had done. The connections that the students and I had created in that class surpassed any that I have ever experienced in a classroom, and the communal nature of our daily interactions translated into high scores on standardized exams and classroom grades. In a sense, I taught science and math but also taught self-discipline, self-confidence, and a belief in being able to change one's future. I attribute my desire to pursue my education beyond my first degree to wanting to show these students that there were no boundaries to what *we* could do.

After teaching for about 5 years in that school, I joined the planning committee to start a new small high school in the Bronx, NYHS, that was dedicated to having students achieve in science and mathematics and enter into the healthcare professions. In this school, I taught physics and learned once again that teaching science in urban areas (where most of the students are immigrants who are perceived as unable to do well in science), requires developing students' confidence and belief in their ability to succeed. Through their experiences in schools, many of them have lost the ability to view themselves as being able to achieve in science and lock themselves into (a foreseeable) future that does not include academic success. Through the creation of communal learning environments where issues that surround student interests and futures can be discussed in conjunction with science, students are able to meet corporate goals such as success on exams.

Nicole: Chris, your narrative speaks very similarly to my initial experiences being a teacher. My very first position was at an elite, private co-educational school in Manhattan. When I started teaching in 2003, I was the only Black female teacher on staff. I was extremely nervous, not about my ability to do the job, but about the perceptions the rest of the staff and my students would have of me. I assumed that some students would openly disrespect and challenge my ability as a science educator. I also believed that the older White faculty would not be receptive to my look nor my style of teaching. Being in my early twenties and Black certainly did not place me in the stereotypical teacher category. I also fell far outside the realms of the model conservative in the school's current image, with my wild curly hair and a strange accent. In addition, I was a woman in a science classroom. To my surprise, my stay at this institution was longer and more pleasant than expected. Five years later, I have generally not encountered any obvious negative ascriptions from students or teachers alike. Each year, I have fostered wonderful relationships with my students despite obvious racial differences, my age, Ivy League education (one which they aspire to). It also seems that similarities to their Caribbean caretakers are the primary reasons for the successful encounters in my science classroom.

In a stark contrast to my experiences at this private school, I had almost the exact same experience as yours Chris on my first teaching position in the CUNY system. I had assumed an adjunct position to teach an evening general Biology course two years into the profession. Again, I was quite nervous, as anyone would be on his or her first day at a new position. I can vividly recall that August day, standing at the front

of the room as students assembled and took seating within the classroom. About five of them, all Latino/a and Black became engaged in a lively conversation while other students continued to flow into the room. About ten minutes later, I was finally addressed by a middle-aged Latina, “Hey, excuse me, do you know who the professor is for this class?” I responded with a smile, “That’s me.” There was almost immediate silence and a full redirection of attention to the front of the room. The next 20 minutes proceeded with a conversation about how I could possibly be the teacher and yet be so young. The class launched question after question, as they became immediately hungry for my life-story and the circumstances that landed me in their classroom as the instructor. They could not bring themselves to comprehend how I was a female, teaching a college science course, possessing the degrees I had, so young and Black. They were certainly not the only ones who were troubled by my image. Two months into the course, I was yelled at by a much older White female instructor whilst opening the laboratory door to begin my class. She mistook me for a student and believed I was entering a lab without the permission of an instructor. I must say I was indeed embarrassed as all my students, waiting outside the room, looked on and awaited my response. When I explained that I was the instructor, not hiding my annoyance, she quickly apologized and scurried down the hallway. When we entered the lab and were all settled, my students cheered my response and wanted to discuss their feelings about the event. I became a representation that signified that there existed hope for each of them to attain their personal goals, a hope that like Chris, I worked to instill daily, through motivation and by being an example. I was initially very excited about teaching at the college level but more so about working with students who were neither White nor privileged. This is not to say that I

harbored ill feeling toward my White children at my private school, but I had always wanted to work with students who looked like *me*. The NYC Board of Education had unfortunately turned me down when I had applied for a science position in the public schools. This rejection created desperation for a job and caused me to accept a job with an independent school. Teaching at this public institution was a second chance to achieve my initial goal. However, I was unaware at how deeply that experience would have affected me. I eagerly entered the classroom to work with this group but not truly perceiving how they would be positively affected by my presence. They demonstrated how much my time there meant to them through frequent dialogue after class, on train rides home to Brooklyn, through emails and through presenting me with a gift on the day of the final exam, one which they pooled money to purchase.

Being in these two very different settings have had a significant effect on teaching and learning in my classroom. I have undeniably learnt a tremendous deal navigating dissimilar classrooms. These experiences have provided a means for me to look deeply within and reflect introspectively. My identity has inevitably been shaped over the years through my daily interactions with a multitude of students, as have been theirs. However, what I have found is that although there have existed obvious differences amongst classroom participants, by illuminating the sameness we all possessed, I was able to show them that we all held similarities and common goals. This has fostered a sense of community over the years in my numerous classrooms and has been instrumental in facilitating the teaching and learning of science.

Planting Future Roots in Science Education

Rey: For over a decade now, teaching in secondary schools especially in the Bronx has been a challenging experience for me as an immigrant science educator. I believe now that effective teaching and learning do not only necessitate knowing fully your subject matter, but also one has to have the energy, emotions, and dedication to internalize the real needs of the students. Coming from a very poor family, I shared similar struggles and aspirations with my students and hope that someday these students will become successful in some ways. The big issue I was dealing with was my identity with them (sort of acceptance) since I looked so different from most of them. True enough, I experienced racial slurs from them but the more they did it to me, the more I sympathized with them. Knowing the different cultural backgrounds of my students really helped me understand that to effectively teach these students, and to ensure that learning was taking place in my classroom, it required “all of me”. Teaching and learning is a cultural undertaking and a subculture in the classroom will evolve when both the teacher and the students begin to identify themselves as “one” with a common objective of learning and doing science as an enjoyable and challenging activity. Sustaining such interest in them to learn and do science was and is the approach I find to be working for them to achieve more. Teamwork and competitiveness have to be established first in the classroom so students will acquire sustained interest and skills to work together with the teacher as the facilitator. I tend to compare and visualize my teaching job like that of a stage actor who is always ready to show a variety of his emotional energy needed to capture the interests of the students to like the science class. Hence, to me “it takes all the inner strength I have” to educate them.

Eileen: The veteran teachers at Taft High School in the late 1960's and early 1970's were too entrenched in their old ways of teaching. I believe that the newer teachers were trying to be catalytic as they worked to create changes - positive changes. However, I don't believe that the quality of life of the students was enhanced because the teachers did not get that involved with the students. Had we formed cogenerative dialogue groups, I feel much more progress might have been made. In addition, although teachers were involved with students, it was not in any way in which teachers gained a shared understanding of who the teachers were and who the students were. We were White teachers trying to help African American students. We really did not take the time to understand who they were, and how different their lives were from our lives.

In the present, my teaching practices in a junior high have a different twist. I am still White, and many of my students are African American, but we have new tools and theoretical frameworks with which to work. In the junior high I have been working in, I introduced cogenerative dialogues. I believe that these have been successful because I have been able to adhere to Guba and Lincoln's (1989) authenticity criteria for evaluating ethnographic research. I believe that all who were involved benefited, and there was a match between the constructed realities of the stakeholders and the realities represented by me, as an evaluator and researcher of science teaching in my school. I started the cogenerative dialogues because the African American female students were extremely underrepresented in the upper level science classes in our school district. As a matter of

fact, when I first started the cogenerative dialogues at my school there was only one African American female student in an Advanced Placement science class at our high school. The goal was to increase the number. Cogenerative dialogues were used as a way to reach this goal. Other teachers would come into my science room during our dialogues, and the students would explain what we were doing. In the dialogues, we took the time to discuss what we were learning, learn about our perspectives, as well as the problem of the underrepresented African American female students. I also discussed the dialogues with other members of the science department during our meetings. During one of our science meetings, our principal was present, and he was very supportive. He is from Jamaica and was shocked to learn of the small proportion of African American students in the upper level science classes. He got on board and suggested that we increase the number of accelerated science classes at the junior high, and changed some of the criteria for students to be accepted into these classes; so more minority students could participate. He came on board and he made it happen. His actions were tactical in that he was the only one that could easily authorize these changes. An extra teacher was hired. The idea was that with increased students in the junior high in accelerated classes, this would continue at the high school level as well. That is exactly what happened. In June 2007, twenty-five minority students took the earth science Regents at our junior high, all passed, 24 with mastery (between 85-100 percent). Of those, fifteen were African American females. All are being encouraged to go on to Advanced Placement Biology classes at the high school next year.

Chris: Eileen, the results that you have attained with your students are amazing. They speak to the importance of ensuring that research in urban schools not only interrogates the practices of students and researchers but also improves the experiences of students that have traditionally been marginalized from success in science. In my work at NYHS, attaining this level of authenticity in the research often meant ensuring that the research that I was involved in went beyond my work with the students. In other words, the goal of ensuring that the research impacted the students' lives in a positive way was just as important, if not more important than gathering data results from the research and presenting the results from the study. It became necessary to go beyond expected researcher roles and responsibilities and ensure that students were given opportunities that they would not have received under normal circumstances. In one scenario, Wes was invited to the school to introduce a colleague of his from a local university to start a science class in the school that would expose students to areas of science that they would not normally be exposed to. In this course, the students would engage in a class that does not have the constraints of a standardized exam-driven curriculum. The class would involve hands-on investigations with scientists of different areas of expertise and students would receive high -school credit for their work. This type of tactical authenticity often requires the researchers use of her social capital to involve stakeholders that are not directly involved in the research. In Eileen's description as well as mine, this involved having the principal of the school involved in improving the experiences of the students. In my case, Wes, a university representative, the school principal and I sat to discuss the possibility of expanding the school's curriculum to include this course. A key theme that presents itself in the process of attaining tactical authenticity is the researchers use of her

social capital and agency to facilitate the improvement of experiences of students who lack the capital or ability to express agency in ways that improve their experiences. I believe that it is necessary that the researcher recognize the agency she possesses and utilizes it to ensure that the students involved in the research are provided opportunities to enact their agency in different contexts.

In addition to the new courses offered to students in the school, the process of expansion of student agency through the attainment of tactical authenticity resulted in the publication of an article co-authored by student researchers, students coteaching science and mathematics classes in the school, and students engaging in their own science education research projects. In my research, the end goal of constantly striving for meeting the authenticity criteria outlined by Lincoln and Guba relied closely on the attainment of beneficence. Attaining beneficence – where all participants in the research receive equal benefits inherently requires a researcher causing/doing good in a way that Varela (1999) describes as compassionate energy without pretense.

Wesley: While coteaching Regents chemistry and doing research at NYHS, I noticed that I was developing a more nuanced perspective about the New York State (NYS) Regents exams. I realized my perspective was shifting from viewing these exams as indicators of academic baselines, to viewing them as one-dimensional assessments. The value of the Regents curriculum and associated exams is that they provide a unifying academic guideline across the state; however, in most cases the Regents exams are taken as the only indicator of rigorous academic achievement in the state. Academic achievement and

growth cannot be captured in one exam, or a group of exams, at the end of the school year. Although the realities of contending with these statewide standardized exams have not gone away, I found that the principal and students were more receptive to other ways of showing academic growth and rigor. In one instance, I recall talking with the students (mostly 11th graders) in our study early in the spring semester about the number of in-class exams they were required to take. When I approached you Chris, as the former assistant principal of science, you seemed to have already had your finger on the pulse of the situation. I remembered that we had several conversations with Rey and members of our research squad about the implications of these exams. We all felt that exams (including standardized exams) were important but a balanced and thoughtful approach associated with these exams needed to be enacted. The students had obviously voiced their concerns to the various members of the staff with whom they felt comfortable interacting with. The students involved in our research indicated at different instances their sense of frustration about being inundated with exams on a weekly basis. One student even mentioned to us at one of our meetings that, "People think you are an animal just because you don't do well on your exams...It is too much." After talking a bit more to that student, I felt that her sentiments were coming from pressures both from home and at school. Parents and school staff members often connected performance on exams with how students are treated and valued. This of course happened at both conscious and unconscious levels. My sense was that, at NYHS, the administration was teaching and testing to the Regents exams. Our opportunity to help address this issue came when the school was looking for an innovative curriculum to put in place for the twelfth grade students. It was an opportune moment because the school was about to have their first

cohort of twelfth graders in the fall and the principal and administration wanted to expose the students to college level work without the rigid structure of standardized exams. We were all looking for an academic program that had rigor but was not driven by advance placement exams. At that time, I was working as a fellow at one of the education institutes at CUNY. The institute had a National Science Foundation grant to help high schools in the Bronx develop and implement foundation courses in science and math. These courses would help to bridge the gap between high school and college level work and move away from a reliance on high-stakes testing. The institute was having difficulty finding venues that would easily accommodate the new foundation courses in their school program. It turned out that NYHS was a perfect school to partner with the institute because they were just beginning to develop their senior year program. Chris, we were at the right place at the right time, understood the needs and opportunity, and had access to key decision makers that the students and parent did not necessarily have access to. As you and Eileen mentioned earlier, researchers must use their agency to act in ways that are tactical to obtain beneficence and help expand the agency of stakeholders.

Conclusion

Drawing on our experiences, we seized this unique opportunity to share our voices and learn a significant deal about our journeys as immigrants and urban science educators. Our readers should be aware that one of the principle merits of this metalogue is in its educative aspect and the elaboration of dialectical thinking to interrogate simultaneous disjunctures and overlaps. Sharing our successes and failures have enabled us to examine the implication of choice in the similarities and differences in addressing

the emerging context of being science educators in NYC and the Bronx. The contingency of choice extends to the practice and affiliation we enact, both within and outside the classroom, with students and colleagues. Through our numerous encounters, we have chosen to work with many immigrant students and other science educators who have been positioned differently in social spaces. Cognizant of the complexity of social life, the intersections and inscriptions of class, racial, ethnic, gender, and other social markers have rendered identity and agency fluid and tentative. As such, we do not perceive others and ourselves as helpless, but in fact recognize that science teachers and students experience passivity and simultaneously act agentially to negotiate and renegotiate science identities.

In each of the themes that emerged, key ideas about attaining success in the face of challenges have developed. Tobin (2007) argues that there is a need for teaching and learning to overlap with the goals of social life. In our discussion surrounding the ecology of the Bronx, we posit that cultural spaces consisting of encounters between longtime residents and newer immigrants coupled with shared interests in science create sites for science students and science educators to build solidarity across modes of difference. Science classrooms provide an important space for those who seek the opportunity to learn forms of science that are central to their lives and gain the social mobility they seek. We also presented ourselves as examples of how immigrant students can in turn become science educators themselves. We also unearthed some of the other complexities and challenges brought forth by globalized forms of mass media and its continuous portrayal of deficit perspectives of groups of people and their neighborhoods. Discussions of the

destitution that have blanketed parts of the Bronx should not be a point from which to associate its residents with a poverty-stricken culture. Based on our many encounters with individuals, we assert that it is unfair and inaccurate to make sweeping claims about others because of where they reside, or their language and other customs.

In the second section, rich conversations about our early immigrant experiences were critical for each of us to understand our shifting identities – a central basis of our growth, development and emergent praxis. Both Eileen and Nicole have provided laden accounts of their migratory experiences, and we can identify several connections to their current schemas and praxis.

The third section on teaching clearly presents stories that mark each of our changing ontologies. Despite various obstacles, we have each held a growing sense of responsibility and have become agentic within the structures we each experienced to work towards improving teaching and learning of science. We realized that, students and teachers still adopt and latch on to very restricted ideas about what science educators look like and how they should act. Our trial-and-error type chronicles also indicate that traditional ideologies about exercising full control over students as the key to success are surely inaccurate. Our collective desire for change have also revealed some creative ways we continue to work with the science curriculum. The numerous curriculum approaches explored and described in the metalogue provide strong evidence that there is no single right way to teach science to urban students. Chris Emdin suggests, that a strong emphasis on student background can reproduce asymmetrical othering by the

dominant ethnic majority. He posits that such an emphasis can lead to the social construction of stereotypes associated with specific ethnic identities. On the other hand, Nicole's experiences as a new educator providing a place to discuss such differences have illustrated the possibility of positive encounters among classroom participants.

The final section speaks to the implications for general practices in urban science education. It stands as an account of our continued growth as educators and contributions to the field of science education. Our conversations illustrate that despite having only a few years of experience in the classroom, we have been able to witness and be a part of numerous successful encounters with students, educators and administrators alike. There are two principal assertions that have derived from our concluding conversations. The first is that extensive experience as an academic or educator by no means determines superior praxis. Our experiences demonstrate that new science educators who are passionate and fervent about their craft can also make good decisions and engage in successful teaching practices. Also, what has truly afforded some of the positive encounters between our many students and ourselves was our willingness to develop solidarity to work alongside them as peers. In this ongoing effort, many of us use cogenerative dialogues as a means for us to value the concerns of our students and work cooperatively with them to ultimately improve teaching and learning science. Building on this understanding, we also maintain that information, whether embedded in displays of text, gestures, or emotions, play critical roles in making people aware of their belonging to a group and hence creating and recreating solidarity and identity. This idea of the importance of crafting a sense of affiliation was articulated in the words of Rey, "teaching and learning is a cultural undertaking and a subculture in the classroom will

evolve when both the teacher and the students begin to identify themselves as “one” with a common objective of learning and doing science.”

In this metalogue, we presented multiple perspectives that are robust and were truly essential in helping us to learn more about each other. However, it also allowed us the opportunity to engage in a way that many science educators may fail to. Despite being colleagues, we communicated, connected and challenged each other on an insightful level. Of prime significance, is the fact that the metalogue provided us with a chance to think reflectively about our teaching practices, our peaks and troughs, and has challenged us to continue to work toward improving ourselves as responsible citizens firstly and as critical science educators. We realize that the future of science education depends on critical analysis of culture and associated affiliation as drivers of social positioning. In this respect, we each work and continue to conceptualize our goals and roles and translate what we know into professional practice (Tobin, 1998). As science educators, we have become aware of theoretical frames that can be used to describe our practices in recursive relationships to our schema. However, as Tobin notes, reflective and conceptual objects are no guarantee that a curriculum can be reformed in the ways that teacher and students envision. Science educators must also acknowledge that students are important stakeholders in determining what happens in the classroom, as should all those involved in their education, including parents. However, the creation of solidarity in the science classroom is of prime significance in the effort to afford successful teaching and learning experiences. With this comes the anticipation that science educators embrace a renewed

responsibility to produce change, become agentic within the structures they experience, and likewise provide numerous opportunities for student empowerment.

Looking Ahead

In the previous chapter we explored modes of solidarity as interest in science and science education emerged across boundaries of difference in urban centers, such as the Bronx. The next chapter a study is presented that explores the creation of interstitial culture to improve teaching and learning of chemistry in NHYS. In this chapter solidarity is theorized as a sense of belonging and affiliation. The next chapter also explores the manner in which solidarity imbued with positive emotional energy scaffolds encounters and the creation of interstitial culture during the teaching and learning of chemistry.

CHAPTER 4

Improving Science Fluency During Chemistry Laboratory Activities in Urban High Schools

Part I: A Continuum of Boundaries

Bronx: A Place to Live and Learn

The Bronx is a dynamic place to live and learn science. Located in the northern section of New York City (NYC), the Bronx has garnered local, national, and global symbolic capital as a quintessential urban (inner city) center. Although what emerges today in the Bronx, as in many other urban centers, is an ecological situation where neighborhoods that flourish are situated next to neighborhoods that are struggling against poverty (Noguera, 2003). For instance, according to the 2000 US Census, the 16th congressional district consisting of neighborhoods in the South Bronx, Kingsbridge, and Fordham, remain one of the poorest districts in NYC (U.S.-Census, 2000). In contrast, the Riverdale section of the northeast Bronx (five miles from the South Bronx) is one of the most affluent districts in NYC. The Bronx's relationship to NYC is that of an outer borough celebrated as the birthplace of hip-hop and the home of the most famous franchise in baseball, *The New York Yankees*. The Bronx also shares in a citywide shortage of nurses and other health care workers that is reflected in a wider national shortage (Kaleda, 2004). There is no doubt that the Bronx has borrowed and given character to NYC. Sections of the borough, such as the South Bronx, once characterized by ecological blight and decay, have given way to a slow resurgence brought about by

neighborhood, citywide, and even global relationships. For newer immigrants the Bronx serves as a diaspora, while for others (particularly multi-generational residents), the Bronx neighborhoods are their homelands. The cultural agglomeration of new and existing diasporas and homelands, within the context of immigration, can serve to create interstitial culture that engenders a hybrid sensibility. That is to say, new modes of cultural enactment (i.e., cultural production, reproduction, and transformation) are being formed in a process of constant negotiation and re-negotiation. This cultural hybridization does not have a precursor existence from a singular cultural form. As such, there are interstitial cultures (i.e., schema and practices) produced that are neither purely indigenous to the Bronx nor indigenous to another place of origin. At the same time, the relationship of Bronx residents to the borough's past is constantly being staged and restaged in the flux of globalization. Cultural enactment produces the need to interact across boundaries, such as age, sex, ethnicity, race, and class. The global flux of immigration has helped to sculpt and shape diversity and its associated boundaries. These relationships, in many ways, are inherited, fostered, and changed by residents of the Bronx. Historic and present waves of immigration have brought, for example, European, African American, Caribbean, Latin American, Puerto Rican, and their descendants to reside in the Bronx. The diversity and relationships produced through waves of immigration have added to the matrix of boundaries formed through a continuum of differences and similarities. Crossing boundaries affords hybrid forms of cultural enactment.

The Cinema of Urban Youth

The symbolic content of [urban] genre film is given moral urgency by a tone of advocacy rather than, a reportorial style. Because genre film convey shared experiences, some of which may not have touched all of the audience with equal impact, the film may employ the literary device of anatomy as a means of understanding the whole of [urban] life through the depiction of its parts. Genre film act as a ritual celebrating a myth, that is, a value-impregnated tale that is truer than mere truth.(Cripps, 1995, p. 362)

In the midst of these relationships are the urban youth who live in the Bronx and aspire to build productive futures. These youth, as other Bronx residents, garner and create social, cultural, and symbolic capital associated with the Bronx and other arenas of their lifeworlds. The imagery that is often deployed about inner city youth of color often portrays them as lacking the necessary skills and culture to do well in science. For this perspective to be articulated at all, it has to be included in the content of popular social culture. These images are historically inherited and also persist through genres of current popular culture. When images get repeated and codified into a formula as narrative, the result is often a genre of films that permit instant communication between filmmaker and audience (Cripps, 1995).The 1979 cult film *The Warriors* portrayed NYC's youth gang culture, while other more current films, such as *Dangerous Minds (1995)*, portray well meaning teachers engaging inner city youth in artificially imported activities, such as ballroom dancing, to prove that the students have the physical and intellectual capacities to achieve in these areas. Although there is nothing wrong with engaging in ballroom dancing, the success of these genre of films depend on deficit lenses of inner city youth deployed in popular cultural imagination. In a sense, these films are theatrical portrayals of the achievement gap. The achievement gap is reified in educational literature through

education statistics mined from standardized testing data and by extension other social gap indicators (Rothstein, 2004). Achievement gap indicators that show continuing disparities in the school science achievement gap between poor youth of all ethnic and racial groups relative to White middle class students fuel the current growing interest in developing innovative approaches to improve the teaching and learning of science (Eccles & Templeton, 2002). Tobin and Roth (2006) maintain that deficit perspectives of students are powerful schema that, on one hand justify the forms of structure that teachers seem committed to, and on the other hand, contribute to truncation of student agency.

The culture of poverty metaphor also invokes powerful images that fuel deficit perspectives about urban youth and their families living in neighborhoods associated with high poverty rates. The culture of poverty perspective posits that autonomous self-sustaining cultural systems of the poor are thought to be carriers of deficits and subsequent problems, such as school failure. The anthropologist Oscar Lewis (1966) and other exponents of this deficit model maintained that the subculture of poverty, consisting of seventy traits, is passed on from generation to generation. In other words, poor schooling performance is rooted in students' alleged lack of cognitive and motivational skills, while institutional structures and inequitable schooling arrangements are exonerated. Richard Valencia (1997) argues that negative images get implanted in ideological spheres of society and help to shape educational practices. For example, Ashraf Shady (2007) described how public school admission committee members inscribed student applicants as African Americans and likely under achievers based upon identifying applicants with stereotypical African American names (e.g., Leqanda

Jenkins). The secondary school, part of the small school movement, was located in an affluent section of NYC. The committee members conflated these names with addresses that indicated that the applicants resided in neighborhoods with high poverty rates in the city. Shady explained that the committee did not accept students who were profiled as African American living in poverty because committee members predicted that these students would have a high rate of absenteeism and score poorly on the standardized exams; consequently, decreasing the school's future academic achievement statistics and attendance ratings. As Valencia (1997, p. 8) indicates, "many adults who develop educational policy or teach students frequently attribute school failure to students, and school success to themselves."

Looking beyond deficit perspectives requires insights into how youth enact culture that is produced, appropriated, and disseminated through youth and adult networks. Macrostructure, such as immigration, race, and ethnicity, become resources for the production of identity through agency|passivity³ and the enactment of culture through agency|structure. Youth culture, as any other formation of culture, takes traction because it helps to structure encounters that are fluent (i.e., timely, anticipatory, and appropriate) among participants. When youth from different social demarcations, and in different locations around the globe listen to the same music, wear similar clothing, use similar modes of global communication, share the same sport and youth heroes the result is often a shared youth culture. Consequently, the youth enact culture that is appropriated through a variety of youth, adult, and mainstream social networks. Urban youth appropriate and

³ The sign "|" separating pairs terms is called a Sheffer stroke. It denotes a dialectical relationship between terms and their associated contradictions.

engage in expressive cultural practices fluently and often unconsciously. They enact stories of who they are for themselves and who they are in relation to multiple groups of others. As Kenneth Tobin (2007) indicates, there is a need to gain additional insights into ways high school students successfully use resources to build identity and enact culture in their lifeworlds (fields) to expand their horizon and succeed in science. In the remaining sections below, I refer to fields as where culture gets enacted.

The Story Unfolds in the Lives of the Participants

The story of the Bronx partly unfolds in the lives of the participants in this study. The four students and two teachers involved in this study are awesome in many ways. All four students presented in this study were born in the Bronx and are second-generation immigrants. They are all females of color. Angel, and Disaya are fraternal twin sisters and identify as African-Caribbean of Jamaican heritage⁴. Amber identifies as Puerto Rican and Diamond identifies as Dominican. The students conduct most of their lives in the borough, and have decided to pursue a career in medicine or the allied health profession. The twins and the other girls met in the 9th grade and formed close friendships by the beginning of the 10th grade both inside and outside of school. Except for the twins, the students differ ethnically and culturally from each other yet share the same youth culture. They all decided to attend New York High School (NYHS)³ in the Bronx, initially because it was advertised as a school themed for nursing. Angel and Disaya's mother is a registered nurse and encouraged her daughters to follow in her footsteps to establish a professional career that would be rewarding and create financial

⁴ Pseudonyms are used to refer to student participants and research site

security. Angel and Disaya's father is a mechanic. Their parents are divorced. The twins reside with their mother. Angel would like to pursue a career as a pediatrician while Angel is aspiring to become a pharmacist. Diamond was encouraged by her mother and father to attend the school because they were very happy with the open house presentation and liked the idea of a small learning environment high school. Diamond lives with both parents and comes from a working class family. Diamond's father is employed as a restaurant manager; her mother is employed as a home attendant. Diamond would like to pursue a career as a social worker and work in a hospital setting. Amber initially articulated that she would like to pursue a career in a science related field. Amber, Angel, and Disaya come from working class single parent households. All four students were born and grew up in the Bronx and live near the school in the Kingsbridge section of the Bronx. I was not able to collect additional background and contextual data about Amber because she transferred to another school at the conclusion of the 10th grade. For these students, learning science in school has become an important ingredient to negotiating success in high school and establishing a career path into the medical and allied health professions.

Rey is a male teacher and has lived in the United States for approximately twenty years. He would ethnically be considered Filipino-American and currently lives in the White Plains section of New York State (NYS) in a suburb approximately ten miles from the Kingsbridge section of the Bronx. Rey has more than twelve years of experience teaching middle and high school science in urban schools. He was originally trained as an industrial water chemist and became a science educator after moving to NYS

approximately 15 years ago from the Philippines. Rey considers himself to be middle class. This study occurred in Rey's second semester of teaching Regents chemistry in NYHS. I situate this study in the chemistry Regents laboratory class taught by Rey, because he differs from the students by gender, ethnicity, age, and cultural background. The participants in the study also share other inherent differences and similarities experienced among human beings. I chose to spotlight Rey and these four students' encounters in the laboratory classroom because these encounters exemplify how student-student and student-teacher interactions can successfully sustain teaching and learning of science across differences. Below, I theorize *encounters* as a form of cultural enactment constituted by a dialectical relationship between interactions and transactions. That is, interactions and transactions cannot presuppose each other and cannot be analytically thought of independently of each other. This study also examines ways in which the participants produce (reproduce|transform) culture to help sustain solidarity while engaging in chemistry laboratory activities.

Social Cultural Frameworks

In-between culture, at the point of its articulation of identity or distinctiveness, comes the question of signification. This is not simply a matter of language; it is the question of culture's representation of difference-manners, words, rituals, customs, time- inscribed without a transcendent subject that knows, outside a mimetic social memory, and across the ouboum-kernel of non-sense. What becomes a cultural identity, the ability to put the right word in the right place at the right time...? (Bhabha, 2006, p. 178)

*Resources: Learning as Cultural Enactment**Capital Exchange Cycle*

Learning science is a form of cultural enactment constituted by systems of schema and dialectically interconnected practices (Sewell, 1999). A conventional wisdom about culture posits that as social life unfolds culture gets enacted and aspects of social, symbolic, and cultural capital are appropriated unevenly (capital exchange cycle) among social actors (Bourdieu, 1986). Capital gets produced (reproduced|transformed), and redeployed in similar and different forms. Social, symbolic, and cultural capital that are historically connected contribute to the structure of a field. As such, social actors use their agency to enact culture to appropriate (additional) capital in fields constituted by material, symbolic, and human resources to meet their goals and motives (i.e., learn science). The resources of a field, such as a science laboratory classroom, workbench, and utterances, can be accessed and appropriated by participants to produce, reproduce, and transform science learning (i.e., culture). Social actors enact and experience culture through practices composed of patterns having thin coherence and their associated contradictions. Although social actors within a field cannot appropriate and enact culture in an identically precise manner, cultural enactment can be aligned to produce successful encounters among social actors and meet mutual goals. Adopting capital and aligning it with others' capital to meet mutual goals form the basis of the capital exchange cycle. As such, differences and similarities are created during cultural enactment. Encounters also structure fields. Encounters are interactions that are dialectically related to transactions. Encounters can be thought of as the fundamental unit of social networks. As individuals interact, they also transact by appropriating resources. Interaction and transactions

intersect within the capital exchange cycle and can help to speed up or slow down the cycle. The capital exchange cycle is also required to build culture around chains of successful encounters and produce solidarity and associated positive (and negative) emotional valence.

Field Structures

Culture is enacted in fields surrounded by porous boundaries (Tobin, 2005b). This leads to an essential understanding that culture from one field can be enacted in another field. For instance, culture produced by teachers and students in the classroom can be enacted in a manner that affords or constrains agency and structures in another field. Social life occurs across multiple fields that can be nested, partially overlap, or aggregated to create more complex fields or organizations. Fields also create resonance structures (i.e., dynamically changing resources that afford dispositions to act) that participants can access and appropriate to enact culture to meet their goals. Fields are also historically and temporally framed and can be nested and reconfigured depending upon the structures and agency experienced by participants in the field. Therefore, structures of a field have a historical connection with prior cultural enactment aligned with dispositions to act. The disposition of a participant to act is afforded and constrained by structural resonance present in a field. For instance, resonance structures (e.g., prior successful verbal interactions with a teacher) might encourage a student to interact with a teacher without anticipating being shut down by the teacher. Resonance structures can also be exemplified in the manner in which social actors enter and exit fields.

Rituals as Cultural Production

According to Jonathan Turner (2002), social encounters are often framed by forms of rituals that keep the flow of encounters fluent and on track. As such, rituals are also forms of cultural enactment that structure fields. Rituals are patterned actions over time, such as embodied gestures, talk, and haptic responses which social actors use to help structure encounters. Turner characterizes bracketing, forming, totemizing, and repair, as the four basic types of interpersonal rituals. Bracketing rituals are used to open and close encounters, while forming ritual are used to structure encounters between bracketing rituals. Totemizing rituals are interactions that have been reified externally and applied to the interaction. For instance, marriage and gift exchanges ceremonies are examples of totemizing rituals because they symbolize the relationship and structure the encounters. What is salient about totemizing rituals is that they can be recognized from a third person perspective; for example, most people would recognize that a marriage ceremony is taking place. Repairing rituals are used to mend breaches that occur in encounters. Repair rituals are also used to help decrease negative emotional energy after a breach has occurred.

A productive way to examine micro level encounters is through ritual and the capital exchange cycle. Social actors appropriate and enact schemas and practices, consciously and/or unconsciously, in order to “enter” the capital exchange cycles, associated with a field, and either speed them up or slow them down. Participants in chains of encounters unconsciously and consciously are appropriating or being imbued (passivity) with capital within the exchange cycle. Consequently, new structures are

created that add to the structure of the field and cause other participants to appropriate or be imbued with capital. The exchange really is the creation of structural resonances bringing about dispositions to act or passivity. In turn, these structures are appropriated by or ascribed by other social actors to create dispositions to act in a manner that is aligned with goals and motives. Slowing down the capital exchange cycle, for instance, can occur by physically moving away from other social actors, ending the interaction by invoking bracketing rituals such as saying good-bye, or creating symbolic or physical violence. Although this may end a particular chain of encounters within the capital exchange cycle, field participants are still engaged and linked to other social, symbolic, cultural capital oriented across micro, meso, and macro levels of social life. As such, social, cultural, and symbolic capital are dialectically linked. For example, students in a classroom can be inscribed unconsciously (passivity) with capital garnered from global macro structures (e.g., nationality) while simultaneously appropriating capital from structures in a classroom. As such, macro and micro level structures can saturate and structure the meso level of social life.

Opportunities in Social Location

Examining encounters across boundaries during the teaching and learning of science is an important goal of this study. Differences in individual and social location are an inherent aspect of social life. Differences between teachers and students and among students in ethnicity, age, roles, and other social markers are factors that mediate successful classroom encounters. As individuals experience sameness, they also experience difference. For instance, students can experience differences in ethnicity and other social markers while simultaneously experiencing being grouped (mechanical

solidarity) with other students of the same age. Students can also share youth culture and culture developed through friendships outside the classroom that get enacted within the classroom. These cultural formations are enacted across fields and social markers of difference. These formations can also be perceived as affording or constricting learning opportunities in science classrooms. Christopher Emdin (2007) notes that when he began teaching ninth grade conceptual physics at NYHS he initially perceived the student friendships and youth culture being enacted in the classroom as disruptive. He was unhappy with the excessive talking, usually off topic, among students in the classroom. Emdin also noted how easily the students would get distracted by the sounds of hip hop songs coming from passing cars and intruding in the physics classroom located on the street level floor of the school building. He explains how the students appropriate the structure of the rhythm of the beat and sway their heads in synchrony. He proceeded to separate students whose friendships he believed caused excessive talking and other disruptive actions in the class. After insisting that the students were separated for several weeks, he found that the students started to shut down in class and become hostile. Emdin viewed the students' disruptive behavior and refusal to do class work as symbolic violence. In turn, the students viewed the separation tactic as symbolic violence. Through engaging with students in cogenerative dialogue, he was able to talk with the students about their collective experiences in the classroom and cogenerate a plan of action to decrease the occurrences of symbolic violence and improve teaching and learning. Their plan of action included not to actively separate friends in the classroom. The plan also included finding ways to enact culture from other fields that were conducive to learning science in the classroom. Culture developed through friendships inside and outside the

classroom was used to decrease symbolic violence and improve teaching and learning of physics.

Cogenerative Dialogue

Cogenerative dialogues are constituted by encounters that create fields in which culture is enacted allowing individuals with different stocks of knowledge to interact with one another. The field boundaries of cogenerative dialogues are porous. Accordingly, culture produced in other fields can be enacted in cogenerative dialogue, alternatively allowing culture produced in cogenerative dialogues to be enacted in other fields, such as a laboratory classroom. Cogenerative dialogues provide opportunities for participants to talk about shared experiences, events, and possible ways to improve social life. Sonya Martin (2006) maintains that this method of discourse and critical analysis can be used to spark a grassroots reform effort in which teachers, students, and other stakeholders come together for the purpose of making positive changes in everyday classroom encounters. Because one of the purposes of cogenerative dialogue is to critically review shared experiences, the dialoguing over resources of power and inequity are important concerns of enacting cogenerative dialogues. According to Theodore Kemper and Randall Collins (1990) power is the ability of individuals to exercise agency and appropriate the resources of a field to impose their personal goals against the will of others. In this way, power can be a resource to create inequity. Power is also dynamic and a function of social location. For instance, a teacher can be powerful in one field and relatively powerless in another. A cogenerative dialogue group is generally structured to vary in size as necessary, usually consisting of two or more participants (e.g. a teacher and a

student) who differ from one another in terms of characteristics, as gender, race, class, and role. In addition, in cogenerative dialogues all efforts are made to flatten power differential created by established hierarchies in other fields. As Tobin and Roth (2006) notes, some students (and teachers) are placed so differently in social space that they have difficulty in communicating effectively across social boundaries even though these boundaries are porous. Bring these students together in cogenerative dialogues provides them with opportunities to produce new culture that afford opportunities to build successful encounters with other students and teachers from different places in social space. In this way, participants are able to access forms of praxis, including schema, pattern actions, and contradictions, that they would not normally have access to. Patterns and associated contradiction coexist and as such, there is a realization that efforts to create and strengthen patterns by removing contradictions will introduce new contradictions. Hence, the aim of cogenerative dialogues is not to remove all contradictions, but to collectively agree upon what is happening, where salient contradictions are occurring, and ways to produce culture that can reduce or eliminate these contradictions.

What is also important is to value perspectives on teaching and learning practices that add to the interpretive framework(s) of the participants. The potential outcomes of cogenerative dialogues can be increased solidarity through shared commitments to changing structures of the classroom and thereby increasing fluent interactions and expanding individual agency (Tobin & Roth, 2006). By actively involving students in cogenerative dialogues, there is a potential for them to help identify maladaptive

practices and schema such as rules that can be oppressive and lead to alienation. For example, when Emdin and his physics students cogenerated a set of tactics to structure seating arrangements differently in the classroom, it provided increased affiliation and shared focus among the participants. As such, participants in the cogenerative dialogue became aware of what was to be accomplished and where others were situated with respect to roles and responsibilities to implement the tactics and achieve the overall strategy of improving teaching and learning of physics. In this manner, science identity can be built with an association of shared responsibility and group affiliation conducive to finding ways to improve learning. Increased group affiliation and agreed-to actions provide resonance structures that allow, in this case students and teachers, to appropriate and align their capital to conduce chains of successful encounter. In Emdin's case, he began to build social and symbolic capital with a greater number of students in the cogenerative dialogue and classroom; as such, decreasing the perception of disrespect and increasing successful encounters, positive emotional energy, and solidarity in the classroom. Encounters that are very successful or extreme failures are usually attached to intense valenced emotional energy and provide instructive topics to focus on in cogenerative dialogues. For example, Emdin's failure to exert control-over the students in his physics class created intense frustration associated with the situation and became a seed to enact cogenerative dialogue. The emotional aspect of participating in cogenerative dialogues attached the possibilities to enact science identities maybe as important as enacting agreed to changes. As Martin (2006) maintains, cogenerative dialogues can make a critical difference in how teachers and students alike experience

and understand science by providing a method for building emotional and mechanical (group) solidarity and bridging social borders.

Cogenerative dialogue provides a rationale to expand the role of students to act as peer tutors. In the following year, Rey joined the faculty at NYHS and began teaching Regents chemistry to the same cohort of students. Diamond, Angel, Disaya, and Amber were in this cohort. Rey initially shared the same frustration with the same cohort of students. Through encounters with Emdin, Rey was able to use cogenerative dialogues to introduce and implemented a buddy system with the students in the classroom. The buddy system took advantage of the friendships the students already developed and also created fields within the classroom where new culture (including friendships) could be built. The buddy system included allowing friends to work together and form their own groupings through mechanical and emotion solidarity. Usually groups of four were encouraged to work together in the classroom and during laboratory activities. The students within a group were responsible to explain to each other concepts being presented during the lesson. As Michael Roth (2007) argues that what students appear to recognize is the need for having appropriate resources for learning and for being able to draw on those resources, in this case each other, that they consider to be the best at the moment. Even if a teacher thinks he knows best, the learning needs of the student is an empirical matter and therefore needs to be solicited from students. The class made time collectively to afford such encounters. Although cogenerative dialogues and the buddy system were not a panacea, they provided structures that allowed classroom participants

to appropriate capital and create culture that would help them improve teaching and learning of chemistry.

Potentialities Beyond Deficit Perspectives

Teachers often perceive urban (inner-city) students as lacking the culture they need to support learning of science. Students also perceive teachers and fellow students with varying lenses that help to guide their encounters in the classroom. Schema and practices that support affordance and deficit perspectives co-mingle with and bond to perceptions of difference. Deficit lenses often neglect to acknowledge the cultural resources that students bring to the classroom from fields outside the classroom that can serve as a foundation to support teaching and learning of science. For example, students who are more expressive and outspoken might be perceived as too aggressive and disrespectful. Also, students who may be accustomed to using humor or exaggerated examples effectively to communicate outside of school and enact culture in this manner inside the classroom might be viewed as off task and inappropriately playful during science laboratory activities. There is a tendency and an expectation for teachers to establish control over students that often fuels struggles for classroom control. Struggles over control between teacher(s) and students increase the incidence of symbolic and even physical violence. Social violence, such as shut downs, can be generated from students as well as teachers and discourage practices that can improve learning experiences. These types of negative experiences can lead to lack of success, produce negative emotional energy associated with frustration, disappointment, and resentment (Tobin, 2007). As such, examining role-to-role and role-to-community encounters provide a potential way to tease out practices and schema produced during classroom science activities, which

serve as a means to improve encounters that take place there. What we can learn from successful student-student interactions is that creating structures and agency that supports positive emotional energy, science identity, and solidarity is a necessary ingredient towards the emergence of fluency in science. The students and teacher highlighted in this study interact, trade roles, and enact culture appropriated from outside and inside the classroom in order to complete a science laboratory activity.

An important outcome of science education programs is to help students build identity around science. The concept of identity is grounded in human action and social life. According to Roth et al. (2007), identity can be understood as dialectically constituted in both the collective and individual. Both individual and collective realms consist of more stable and long standing parts, as well as, parts that are shifting through time and social space. The unconscious inscription of identity (passivity) also mediates identity construction. As such, identity is constituted within the agency/passivity relationship. Students' use of cultural capital in science class influences whether they experience successful encounters and whether students will feel confident in expanding their personal agency to build identity as a successful science learner. Students' identity as a science learner is also shaped, in part, by their teacher's perception; hence, a teacher's response to cultural capital in science class mediates whether students will experience successful classroom encounters. Cultural capital that is socially acquired in the students' fields, inside and outside of school, can create the type of sustained interest and physical and emotional entrainment that is critical in the development of solidarity and membership in science culture. Classroom participants must become aware of

productive ways to build solidarity across age, gender, ethnicity, and social class boundaries to create and sustain successful teaching and learning of chemistry.

Research Frameworks and Practices

Solidarity

Solidarity is an affiliation and a belonging together that produces synchrony (coherence in practice) and shared schema among participants in a field. It is the coming together of multiple ontologies. There are collective and individual responsibilities that are associated with the affiliation. Salient to the affiliation is a feeling that, "I will look out for you," or "I share culture with these people," and there are collective responsibilities and obligations that shape encounters between them. As such, solidarity requires the acceptance of others' culture that bind the collective together embodied in modes that create synchrony. The evidence for synchrony might include coordinated eye contact, head movement, gestures, prosody, body orientation, overlapping speech, enactment of rituals, and haptic proprioceptions. In this manner, rituals (or practices) such as humor, smiles, high-fives, and sharing anecdotal metaphors can serve as evidence of synchrony during encounters that build on each other. Synchrony is supported by positive emotional energy, mutual focus, and entrainment. Practices that are synchronous generate emotions that are positively valenced and lead to entrainment.

Emotions

The sociology of emotions, grounded in the works of Randall Collins (2004) and Jonathan Turner (2002), provides a theoretical framework for understanding

encounters. Collins posits that successful encounters are associated with positive emotional energy. I use this theoretical framework to understand the extent to which emotions become associated with synchrony and provide resources to create social networks. As such, positive emotions support synchronous coparticipation and provide resources to create communities of learners. In contrast, indicators of negative emotions, such as fear, frustration, and anger, lead to unsuccessful encounters. Negative encounters can occur when there is lack of synchrony and can be embodied in ritual that shut encounters down (e.g., cursing, abruptly walking away, hiding one's face). Turner maintains that emotions are positively and negatively valenced. Turner identifies four primary emotions of which three are negative (aversion-fear, assertion-anger, and disappointment-sadness) and one is positive (satisfaction-happiness). Each valenced typology can vary along a continuum of three stages of intensity (low, moderate, and high). These emotions can be mixed to produce first order elaborations. For example, satisfaction-happiness plus aversion fear produces wonder, hope, relief, gratitude, pride, and reverence. Chains of encounters are imbued with emotional energy. For chains of encounters to be sustained and successful, there must be a net positive emotional experience throughout the set of encounters. Paying attention to the emotional energy in a classroom helps to increase successful encounters, maintain synchrony and coparticipation, and minimize negative emotions that can contribute to a classroom spinning out of control.

Entrainment

Entrainment occurs when chains of encounters interconnect and build on each other, providing structures for subsequent encounters that are fluent. Collins posits

that successful encounters are associated with positive emotional energy. Entrainment can happen with immediate successive encounters or can be out of phase where there is an appreciable time lag (e.g., five minutes or more) between directly related encounters. For example, students at different workstations at different time periods during the same classroom activity can become excited as they successfully complete an experiment at different moments during the class. Instances of positive emotional energy can build on each other to ratchet up solidarity in the classroom. Mutual focus is characterized by a shared focus for an encounter. For instance, in the vignette described below, the system of test tubes in the white test tube rack is the object of mutual focus. The four students form a work group and gather around the rack to conduct the experiment. The group is formed through both emotional and mechanical solidarity. The students have formed prior friendships that involve emotional bonds, they also share in building science identities together in the classroom, and the teacher structured the activity in a manner that requires the manipulation and observation of the test tubes in groups. Shared focus can also be constituted in conversation associated with shared ontologies. For example, when students begin to share ontologies when they discuss what occurred during encounters associated with the rack outside the laboratory class. In this manner, the rack becomes a referent (a conceptual object to think with) to focus on in shared conversation. Consequently, solidarity is a form of symbolic capital that emerges from successful encounters in the cultural enactment of participants in a field (Tobin, 2005b). As argued below, it is involved in the building of capital to meet goals and motives.

Moral Solidarity

A moral solidarity can be built around culture that encompasses sameness or difference. Cultural dispositions that are socially acquired in fields outside school, and are shared to a high degree by students can create the type of sustained interest, physical, and emotional entrainment that is critical in the development of solidarity. For example, difference can be characterized by an expressive individualism. An individual can express his or her individuality and yet still belong to a culture. As such, individuals experience difference simultaneously with sameness. As described earlier difference is in a dialectical relationship with sameness. In order to build a moral solidarity that gives students the right to be present and participate students must have the ability to identify with a group that they like and identify with the subject matter. In addition, participants must identify with success and build capital with what they learn to improve the quality of their lives. Often successful science lessons are not the result of a well-written curriculum or expert teacher (although both are important), but rather the product of a successful cooperation and coordination involving teachers and students. As such, a moral solidarity is important in order to building science identities and create successful encounters in science classrooms across differences.

Interpretive Research: Authentic Ethnography

This study is grounded in a tradition of critical interpretive research that aspires to improve the quality of teaching and learning science. Infused in this tradition of research is the obligation to address inequalities inherent in social life and to identify sites of strategies by which transformation can be accomplished (Kincheloe, 2001). Critical interpretive research addresses the intersection of ontologies that serve to bring to light

contours in schema that help to structure agency and passivity. Associated with this obligation is the stance that the processes and outcomes of research are a collective responsibility to afford agency of those directly involved in the research. An equal responsibility highlights the necessity to enable students, teachers, and other stakeholders to change their social position to work against destructive social reproduction. A key component of this study is ethnographic research that embraces an emergent designed so that there are greater opportunities to contribute to the changes in classroom practice guided by unfolding research findings (Roth, 2005). I employ authentic ethnography as a methodology that guides the manner in which I collect and interpret the body of data. These data sets are used to gain insights and produce empirical evidence for successful and unsuccessful encounters. Authentic ethnography is embedded in an overarching ethical stance incorporating plural voices and polysemic perspectives. This means directly engaging research participants, other researchers, and stakeholders to gain multiple perspectives in data collection, interpretation, and presentation. Authentic research puts into central focus the necessity that the research must make a difference in the social lives of the stakeholders. As such, authentic research takes into account that social life changes through the agency of an individual and concomitantly through the agency of others (the collective); however, agency is also dialectically interconnected to passivity. So, as fields get structured differently across the macro, meso, and micro levels social of life, so do agency|passivity. In the case where a student enters a classroom, he or she may unconsciously experience structures associated with deficit perspectives that help to write their identity and constrain or afford their agency. The student may write his or her own identity as ready to learn and cooperative, while others in the class, including

the teacher, may write his or her identity as uncooperative; allowing breaches and contradictions to occur in the classroom. In this manner, the student might experience resistance when trying to engage social networks in the classroom to meet her goals and motives (i.e., learn chemistry). Authentic ethnography requires that research participants, particularly university researchers, create structures to help participants meet their goals and benefit from what is learned from the study. An important aspect of this study is to also infuse a system of quality criteria that guide connections between research method, practice, and theory. I adopt a system of authenticity criteria for judging interpretive ethnographic research provided by Egon Guba and Yvonna Lincoln (1989).

The quality criteria include ontological, educative, catalytic, and tactical authenticities. Ontological authenticity refers to the manner in which all stakeholders enhance their own emic constructions of social life as they relate to what they have learned from the study. Ontological authenticity requires that participants know where their perspectives are situated in relationship to other stakeholders. Educative authenticity represents the extent to which stakeholders understand the implications and nuances that emerge from the study. What is salient here is to gain shared understanding as to how stakeholders represent and make sense out of social life. Educative authenticity is part of the mechanism for documenting the changes in ontological authenticity. As such, its authenticity requires that mechanisms are deployed that afford all research participants the opportunity to be aware of the perspectives of other stakeholders. For example, the students and Rey should be aware of the different ways they are making sense of what is happening in the classroom. I use cogenerative dialogue as a method to

document ontologies and changing ontologies as the result of negotiations and the explorations of what is occurring in other fields (e.g., laboratory, home, and back of the classroom). Opportunities to examine participants' perspectives facilitate the awareness of coherences and contradictions associated with the different ways of making sense. This approach has the potential to generate opportunities to come to a shared understanding of how to resolve contradictions, although it does not necessarily mean that participants must change their ontologies. Also at the center of educative authenticity is the requirement that stakeholders outside the research group understand the implications of the study. One way to accomplish this is to make outcomes of the study publicly available in a responsible manner. Together educative and ontological authenticities necessitate that the benefits gained by the participants in the research must outweigh the harms.

Catalytic authenticity relates to the obligation of the research and researchers to define ways to expand the agency and catalyze positive changes of all stakeholders involved in the research. Catalytic authenticity requires that participants should improve the quality of their social life as a result of being involved in the study. One way to achieve catalytic authenticity is to negotiate and share responsibility for action(s) and follow-ups that foster positive change. Tactical authenticity refers to the extent that stakeholders have enough agency, within the agency|structure and agency|passivity relationships, to bring about positive change. Tactical authenticity is important to maintaining the on-going beneficence of the study. As a researcher, I have an obligation to create structures that expand the agency of all participants, such that they can and do

benefit from what we have learned from research. This system of criteria should be viewed as a whole and approached in a dynamic fashion that provides implicit and explicit concerns for collective social transformation and agency starting with the research participants and going beyond immediate stakeholder groups. I use this system of quality criteria to enhance fluency in the process of conducting this study and to help connect practice, research, and theory. I also utilize the authenticity criteria to assure mutual respect for the autonomy of all, beneficence and justice for all human subjects participating in this study as articulated in the Belmont Report (1978).

Research in New York City

For the past three years, a group of researchers has collaborated in an ongoing study in urban science in NYC. The group consists of university researchers, teacher researchers, school administrators, and high school students. This research builds upon the research conducted in schools in Philadelphia (Tobin, Elmesky, & Seiler, 2005) and in NYC (Bayne, 2007), particularly at NYHS. Cogenerative dialogues and coteaching were utilized as key research tools in both cities where research took place. In the research presented in this paper, I participate as a coteacher and ethnographer. The students were also coteachers and were encouraged to use the buddy system described earlier to support their coteaching and learning. The four students were also encouraged to expand their agency beyond the buddy system. Rey participated as a coteacher and coresearcher. Coparticipation allowed me and other participants to enact culture in direct ways in order to gain insights and resources that might otherwise have been inaccessible. Throughout the study, Rey and the students were interviewed and we all participated in cogenerative dialogues. Cogenerative dialogues were used to construct additional

learning opportunities after the laboratory activities were completed. The dialogues were also used as structures to afford opportunities to generate shared understandings from the study. As such, the dialogues provided structures to produce praxis, consisting of contradictions, patterns, and schemas that would normally not be produced. Patterns of coherence and contradictions were searched for across multiple data resources including video and transcripts gathered from cogenerative dialogues.

Data Resources

I employed an array of research methods that included ethnography, cogenerative dialogues, coteaching, conversational, and video analysis. The data presented in this study originates from a database that includes videotapes, observational field notes, interviews, and transcripts generated from audiovisual and written resources, such as cogenerative dialogues and classroom lessons. Chemistry lessons and associated cogenerative dialogues were videotaped several times per month over a period of three months during the 2005/06 academic school year. Research participants collected video and audio resources. Video and audio were digitized and rendered using i-Movie (Mac OS X) and Apple i-Pod, respectively. Micro- and meso-analysis were conducted by reviewing segments of videotape footage at different speeds. Mini interviews (i.e., huddles lasting less than five minutes) conducted during the laboratory activities with Rey and/or the students along with discussions associated with cogenerative dialogues guided my initial selections of salient vignettes from the video footage. I selected vignettes in duration of 30 seconds to 3 minutes and examined them at different speed renderings that facilitated meso- and microlevel analyses. I viewed the vignettes looking

for patterns of contradiction and thin coherence across and within these two levels of analyses. Selecting empirical evidence for solidarity was guided by physical and verbal displays of synchrony, mutual focus entrainment, and emotional energy as described above. Selected vignettes were also examined for markers of asynchrony associated with actions that were inappropriate, untimely, not anticipated. Actions that were out of synchrony included displays of negative emotions accompanied by verbal and/or physical disapprovals and challenges. Selected vignettes were played repeatedly to look for verbal and non-verbal actions and other resources, including macrolevel resources, which structured the encounters. Meso level analysis was conducted by allowing the vignette to play at normal speed, while micro analysis was conducted by playing the vignette at increased and reduced speeds, sometimes frame by frame (three hundredths of a second), to discern how individuals appropriated material or human resources. Pauses and duration in prosody were measured with a software package called PRAAT (Boersma & Weenink, 2006). Pauses and duration in speech production also serve as way to consciously and unconsciously appropriate resources and change speakers (Roth & Tobin, 2007). Captured pauses were recorded and inserted into the transcripts. I also showed the footage to research participants and other education researchers in my research squad to gain multiple perspectives about: *what was happening? and why was it happening?*

Macro Trajectories: High Stakes Testing and Small School Reform

High Stakes Testing

Economic implications of rapidly developing global society create pedagogical imperatives implicated in encounters among students and between students and teachers.

Economic globalization sets the context for many other forms of globalization. Mike Bottery (2006) conceptualizes economic globalization into three spheres characterized by financial, market, and transnational corporate long-term trends. The first sphere identifies rapid and unrestricted global movement of finances that is often coupled with the second sphere articulated in patterns of interlocking nation-states into market arrangements by supranational organization, such as the World Bank and the World Trade Organization. These supranational organizations often result in imposing organizational metrics to limit the scope of state activities and prevent nation-states from setting priorities that may yield greater benefits for their citizens. The third trend identifies patterns directed by transnational corporations that influence government policies through their ability to rapidly relocate their capital, factory, and workforce resources. These economic spheres partially facilitate the worldwide exchange of organization and systems of performance that connect recursively into the macro- and meso-level contexts of social life. Economic globalization also implicates itself through many educational institutions by governmental directives, which tend to be seen as a controlling and directing force. For instance, in the 1950s and 60s Japan and China promoted education in engineering and science as necessary for their economic growth and national security; while political and educational leaders in the US encouraged schools to graduate more students in science, engineering, and mathematics in order to win the Cold War and gain military and technological superiority over the Soviet Union (Spring, 2006).

Since the late twentieth century the emerging globalized age of science and technology, particularly in communication, information, and life science technology,

coupled with the changes in the world economy have influenced the domains of school organization and high-stakes testing. The 1983 *A Nation at Risk* report issued by the US government sponsored Education Excellence Network placed the state of education as a central indicator for US sustainability as a global economic force. The federal (name of commission) commission that reviewed the report blamed decreases in US market share on the decline in quality of public schools. The risk was reified as the emergence of other global economic centers of power, such as Japan and Germany, signifying a potential redistribution of markets, science, industry, and military domination away from the US. Increased government funding was given to agencies, such as the National Science Foundation, to supported science education and science education research in the decade that followed the publication of this report (Tobin, 2006). A plethora of top-down national- and state-level standards and conditions were placed on schools. Federal school aid became tied to rising standardized achievement scores. These high-stakes tests are part of policy design that produces outcomes used to make important decisions that affect students, teachers, administrators, school communities, and districts (Au, 2007). In the year that followed the *A Nation at Risk* report, the New York State Education Department (NYSED) enacted the 1984 Regents Action Plan. Named after the NYSED governing board of Regents, the plan called for an increase in course requirements in mathematics, science, art, and history and the expanded use of curriculum-based exit exams in order to receive a high school diploma (Alexander, 2002). William Boone and Lisa Donnelly (2006) maintain that with the current changing world economy, it seems likely that emphasis on high-stakes science tests will continue as technology and science related

jobs are increasingly sought after, and policy makers attempt to optimize the teaching and learning of science.

A more recent example of national educational policy aimed to increase US national and international competitiveness in the world economic market is found in the 2001 No Child Left Behind (NCLB) federal education legislation. It rearticulates a political push to adopt standardized curricula and high-stakes testing. NCLB requires states to administer standardized exams at various transition points as students progress through K-12 education. NCLB provides federal funds to school districts in states that show yearly progress through a measure of testing in English, math, and starting in 2008, science. In order to comply with NCLB and receive funding, New York State uses the Regents exams in English and math to assess a school's performance and its NCLB yearly progress metric. Currently, forty percent of all students in a high school must pass the English and math Regents exams to "make yearly progress"(NYHS for Nursing and Health Professions Proposal [NYHSP], 2003) NYS Regents exams are closely related to the state's curriculum guidelines, and given its long history, are deemed to be well-established state education performance indicators by the NYSED. Their use as a testing instrument is also valued as being in compliance with NCLB (Greenlee, 2007). The Regents exams have been sponsored by the NYS Board of Regents and have played a historic role in setting standards and promoting educational reform. The first set of Regents exams was administered to high school students in June of 1878. Since their inception, the exams have been designed to create changes in state and district-level curriculum and in teaching practices.

In 1994 the then NYC Board of Education enacted a new policy that stated that starting with the high school entering class of 1994, all students would have to take Regents-level math and science courses before they could graduate. Prior to this change in policy, the Regents exams were considered to be a low- to medium-stakes exam (Bishop, Moriarty, & Mane, 1999). Regents exam scores were supposed to only count for less than an eighth of a student's final grade. Students did not have to take Regents-level courses or exams to graduate from high school. In addition, colleges did not require Regents exam scores in order for students to be admitted; however, more highly competitive college programs preferred admitting students who successfully completed the Regents course of study. In order to meet minimum standards to graduate high school, a system of Regents Competency Exams (RCTs) were in place for students not in the Regents track. The RCT track was considered one with low-standards. For example, the RCT math exam did not include algebra or geometry, whereas the Regents math exams included algebra, geometry, and trigonometry. Two years after NYC imposed the mandatory Regent-level course of study curriculum, NYS required students not to only take Regents-level courses, but to take the English Regents exam and earn a passing grade of 55 percent or higher in order to graduate from high school.

Associated with academic progress compliance is a promotion of character education, interpreted by the US Department of Education as a key feature incorporated in NCLB to change the national culture of American schools (Spring, 2006). Projected in NCLB's initiative to change the culture of the schools is an analysis of social problems in

terms of individual responsibility for deficiencies where the formula of action is to correct differences and deficiencies. Joel Spring (2006) points to deficit perspectives embedded in NCLB character education initiative. He writes that the perspectives related to poverty, poor school performance, crime, and other social problems are often presented as the result of failure in personal character and value. According to Spring, this perspective guided the NCLB's promotion of moral instruction through faith-based partnerships in education. An outgrowth of this thinking projects the regiments of standardized testing as a resource to help students develop self-discipline and strong work ethic.

For example, a recent article by Maggie Haberman (2007) in the New York Post outlined a newly proposed "conditional cash transfer" program by NYC that will pay students and their families under the poverty line to pass standardized exams. In the proposal, high school students and their families will receive \$25 per month for 95 percent attendance, \$600 to pass each Regents exam, and \$50 per student when they obtain a library card. The economic incentives described in this plan are rooted in the culture of poverty deficit model. The city policy makers cite a key goal of this policy is to increase the graduation rate of Black and Latino children living in poverty. This model ascribed deficiencies, such as lack of self-motivation and moral responsibilities, that must be overcome to succeed in schooling and the high-stake testing regiment imposed by city policy makers. This plan fails to take into account the dysfunction in social and private institutions that help to create social inequality and the agency the people in poverty, particularly children, enact to help meet their goals. For example, Elmesky (2005)

argues that in many urban classrooms where most of the students come have social histories that differ from the teaching body, there is not only a dispositional disconnect between teachers and students but also a concerted effort of teachers and administrations to "make" students fit the mold of a "model" student. There exist an overall rejection of student practices that lie outside the boundaries of mainstream culture, without an attempt to understand how agency developed in social histories provide students with opportunities to access and appropriate resources to become successful learners in science and other subject areas. The salience of this deficit perspective factors associated with institutions, as such constraining and facilitating practices manifested through to meso level context and encounters. The school district administrative offices, the small learning community, and classrooms within the school are all organizationally complex and are constituted by fields (or sites of encounters) where culture is enacted.

Small School Reform

The more recent development of national standards and high-stakes tests under NCLB in the US has also coincided with the small school movement. Improving teaching and learning through the creation of small school or schools-within-schools has become a national trend in the US. Educational policies in the US that favored large comprehensive high schools, typically housing 2,000 or more students, lead the way from 1900 to 1960 (Howley, 2004). During that time period, large comprehensive high schools were taught to increase efficiency, allow schools to offer a wider variety of programs of study to students, including vocational opportunities. This trend began to be reversed in 1980s and 90s, in the light of unintended outcomes of comprehensive high schools. Currently, many of the lowest performing large high schools, with high dropout, high

incidence of violence, and low attendance rate, are located in urban centers across the US. A compilation of studies published in the 1970s and 80s, and subsequently reviewed by Mary Raywid (1995), helped to galvanize education policymakers in favor of small schools. These studies concluded that the expansion of small schools, particularly in urban centers, would improve classroom teaching and learning. Raywid (1995) points out that the concept of small schools- small learning communities or houses- has had a long tradition in other nation-states. For example, private high schools in England have maintained a long tradition of configuring groups of students into houses. The majority of public comprehensive high schools in England adopted the house system in the 1960s and 70s.

Small independent high schools, such as Central Park East Secondary School in NYC, have also existed throughout the US for many years. Central Park East was established in and continues to configure its study body of 450 into three separate "houses." Craig Howely (2004) defines small schools as schools that are organizationally not too large for educational circumstances where the student body ranges from about 20 to 1000 pupils. Schools-within-school represent different degrees of autonomy, but typically have their own personnel and program, and their students and teachers are self-selected. The term school within a school is often used to denote a variety of small learning communities. Some small schools designated as career clusters or pathway provide structure that organize students according to their career goals and interest and become the foundation for integration of high academic standards, technical skills and knowledge. Career clusters identify academic and technical skills needed by students as

they transition from high school in to postsecondary education or employment (Cotton, 2001). Although the primary focus of the current small school reform appears to be school size, among the primary goals of the school reform is to increase graduation rates and prepare students for college. Coupled with these goals are claims and outcomes sought for small school reform. Some of these assertions include that: (1) the link between poverty and achievement is weaker in smaller as compared to larger schools, (2) children living in poverty have higher achievement in small schools, and (3) participation rates in school activities are much higher in small schools than large schools (Howley, 2004). While the evidence to support these assertions is still being debated, variability in school size does not automatically create a better learning environment. There are small and large high schools that fail and succeed for a variety of different reasons. In fact, the challenges of creating a small school, particularly urban small schools, might readily be seen in the lack of scope in addressing systemic reform issues, such as hyper-segregation associated with poverty, and the sustainability in financial support for the growing number of small schools.

Funding and political support from the federal governmental and philanthropic organizations, such as The Bill and Melinda Gates Foundation, have supported the small school movement (Miner, 2005). Congress earmarked \$45 million in funding for the fiscal year 2000 to aide state school districts' development and expansion of small schools. In the following year, an additional \$125 million for planning and to help large high schools reorganize into small schools was appropriated to 200 school districts, including Chicago, New York, Philadelphia, and Seattle, by the US Department of

Education. In response to this initiative and support, some school districts began experimenting with ways to make the high school experience seem smaller and more personalized as a way to boost student achievement. In NYC, this infusion of funding and political support increased the momentum of its small school reform efforts. The small school movement in NYC took shape when the then Board of Education launched its small school initiative in 1992. In the next two years that followed thirty-two small schools were opened in collaboration with philanthropic organizations such as The Center for Collaborative Education and the Association for Community Organization for Reform Now (ACRON). In recent years, the initiative's pace has accelerated with support from the Bill and Melinda Gates Foundation and New Visions for Public Schools education reform organization. The Gates Foundation has also focused on education reform through the small school initiative, particularly at the high school level, and has contributed \$100 million to NYC to help fund the creation of approximately 140 small schools. The Gates and the Carnegie Foundation have partnered with intermediary organizations such as New Visions to help the NYC Department of Education (DOE) establish small schools as failing high schools are closed and reorganized. In the past five years, NYC has open 184 small schools. More than half of the new small schools have been conversions of large schools into smaller units with varying levels of autonomy. For new small schools the goal is a maximum of 100 students per grade level. A large subset has been New Vision's New Century High Schools, including NYHS.

New York High School and the Chemistry Regents Examination

In recent years, a common situation for youth in the Bronx is to attend large comprehensive high schools or small schools, which are often carved out from larger

school buildings (Kozol, 2005). The development of small public high schools, sometimes in physical plant of their own, more frequently organized as smaller schools (or small learning communities) within larger schools, evolved to address arguments against large public high schools, where students' personal circumstances are not known to teachers and administrators. Articulated in this argument was that careful development of these high schools would create an atmosphere where the school occupants would be safe, good teaching would flourish and the students would thrive personally and academically due to the intimate settings that small school make possible. As such, school organization presents different temporal and material resources associated with the success and failure of the school and schooling. Schools as organizations succeed and fail with face-to-face encounters created in different fields that contribute in significant ways to cultural enactment. For instance, institutional power that attempts to entrain students and teachers into bell schedules and accountability through testing and failing grades ultimately may mediate to forms of alignment and conflict that can become integrated into the practices and schema of all school participants. In other words, schools are not only produced by mechanical solidarity and structures that are inflexible in how they operate or get reproduced. In fact, what makes a school or classroom what it is, lies heavily in the culture produced, reproduced, and transformed, in sometimes indeterminate encounters and other times predictable collective action (Roth, 2005).

An example of this is the manner in which reorganization or testing directives are disseminated from national or state education offices to the school district can become a resource that structures the fields within a school, along with events and encounters

associated with individuals that populate the field. An important issue for urban schools, whether small or large, relates to how fields are populated and intersect to create complex structures. These structural resources can be associated with new forms of interstitial culture that constitute fields and mediate the agency|structure and agency|passivity relationships. A key issue raised by Roth and Tobin (2007, *Identity in Science*) is to consider finding ways for individuals having vastly different cultural dispositions to enact legitimate culture that is interstitial and accepting, given its insurgent character. In this way, there is a need to rethink and develop school-based practices and resources that contribute to the creation of moral solidarity around difference linked to the collective understanding. Homi Bhabha (2006) notes that it is "the emergence of interstices-the overlap and displacement of domains of difference- that the intersubjectivity and collective experience of nationness, community interest, or cultural value are negotiated" and "formed, 'in-between', or in excess of the sum of the 'past' of difference (usually intoned as race/class/gender)" (p. 2). As new schools are organized, they become places where new forms of interstitial culture can get enacted. This takes place in fields that in turn are saturated by culture from the macro and micro level of social life.

NYHS is a relatively new small learning community. It is a public secondary school with a theme for nursing, medicine, and allied health professions. NYHS was created using the small learning community model under the cluster of New Visions: New Century High School Initiative. The model focused on developing small schools with academic themes to foster a better sense of connectedness and community school spirit and learning environment. Articulated in the NYHS school proposal was the use of

the small learning community model as a resource to implement and deliver more academic and support services to students coming from backgrounds of poverty and low economic standing aspiring to pursue a career in the health professions. The school was organized with New Visions, DOE, and a community-based organization as lead partners, along with faculty members from the science and health sciences departments from a partnering university. Two health care providers from a local hospital, a parent, and a recent high school graduate pursuing a career in nursing also participated on the NYHS planning team. One of the school's central missions has been to prepare and encourage students to enroll in academically demanding college science majors that would ultimately lead to professional careers in health and medicine.

The team asserted that there was a clear need to create a small school themed for health careers, particularly nursing, in an effort to address the current shortage of health career providers in the Bronx. In the proposal application, the team expressed a desire to have all NYHS graduates possess, "an impressive command of contemporary and future health issues" associated with the Bronx (and), "qualify for future professions in the health field" (NYHS for Nursing and Health Professions Proposal [NYHSP], 2003). The school plan also called for clustering students in corresponding grade levels into block scheduling. This effort was meant to concentrate classroom contact time, particularly in math and science courses. Each math and science course was scheduled to meet three times per week for ninety minutes. Although the school plan articulated a directive to infuse project-based learning into the curriculum, "providing extended teacher-student contact time [to] help students meet their academic goals, state standards, and focus on

skills necessary to pass the required Regent's exams," this directive became a dominating structuring force in the proposal and eventual organization of the school. For example, according to the proposal, junior and senior students would be required to conduct a community-based health project; however, by the time students matriculated into the junior year, no research course was put into place that would help the students carry out their community health projects. Instead, there was a tendency to tack on additional classes at the end of the school day and tutoring classes on the weekends in order to prepare students to take the Regents exams.

Macro structures in the form of national and state imposed school evaluation requirements, including high-stakes testing, served to structure the teaching and learning philosophies and development of NYHS. Encounters and decisions to start NYHS, however, originated from macro school reform (small school initiative) policies that created and structured resources. These resources provided implications for the aspirations of the students who attend the school. National and state education policies driving the administration of Regents exams attached to school accountability standards and funding are also driving the choices that are being made on behalf of the students who attend the school. Consequently, as many of the students express their aspirations to pursue careers in the health professions, their education is being structured in particular ways that do not address cultural resources that the students bring to help them learn science and meet other goals. The school has the status of focusing on science and math, and aims to have all students attend college. However, as the school opened and became organized around the theme of health careers, circumstances of difference and similarities

were produced. For example, students from different streams of immigration into the Bronx, ethnic background, and academic histories were group into corresponding grade levels and learning situations where they had to encounter testing and curricula policies. The implication of which is seen in how students access resources and enact culture to expand their agency and create identities to meet their goals and motives.

The day-to-day enactment and reenactment of schema and practices, and the assignment of sanctions and benefits according to how schools conform to national and state institutional evaluations and in turn how students conform to institutional prescriptions create encounters imbued with emotional energy. As such, institutional educational initiatives and student aspirations get combined and routinely altered by the characteristics and outcomes of chains of encounters. The encounters become reified into routines constituted by resonance structures that can potentially build productive ways of learning and affiliation across dominant systems of classification and categorization. In other words, even if the students who attend NYHS are inscribed using categories of difference, such as urban, Black, 10th grader, English language learners, similar aspirations that motivate the building of culture around teaching and learning of science can make a positive impact to the quality of students' lives and the quality of life in the Bronx.

Looking Ahead

Part II of this chapter explores meso- and micro-level encounters using the socio-cultural framework established in part I. In part II, ethnography and conversation analysis are used to explore how participants in this study 1) enacted culture to appropriate

different roles, 2) monitor and diffuse potentially disruptive practices, and 3) create and use culture from other fields to successfully enact science fluency in ways that create solidarity across difference. Empirical evidence embodied in the participants actions, such as prosody and body gestures, are highlighted and presented in a coordinated fashion to provide a synthesis of teaching and learning of Regents level chemistry during a pH laboratory lesson in NYHS. A feature of this synthesis explores the creation of culture associated with the emergence of solidarity, including collective responsibility. The quality of science fluency, including the roles and rituals that mediate the accessing and appropriation of resources to enact coparticipation in science emphasizes the identification and utilization of cultural capital students bring to the classroom. This coupled with ways to enact curricula that allow students to meet their goals and motives and use what they know can serve as a foundation for science fluency.

Part II: Bringing Cultural Resources Forward

Introduction

As indicated earlier in this chapter, there are good reasons to give priority to creating resources that allow students to sustain solidarity and positive emotional energy in order to improve teaching and learning of chemistry. Correspondingly, alignment with respect to interest, motives, actions, and responsibility, can unfold in signs of emotions, body gestures, and prosody of speaker. These forms of cultural resources help to structure cultural production associated with success in teaching and learning chemistry. However, many of pedagogical approaches make assumptions about teaching and learning that imply that resources must focus on macro structures, such as high stakes

testing, in order to build success in science. As exemplified below, this assumption can often lead to alienation and avoidance. In part II of this chapter, solidarity, positive emotional energy, and prosody, are explored as empirical evidence for success and fluency in the context of learning acid-base chemistry in NYHS.

Setting: Chemistry, Regents, and NYHS

At the time of this study, the school had completed adding grades seven through ten bringing the population of students up to approximately 400 and was anticipating their first graduating class in the next two years. NYHS shared the physical plant with two middle schools, one of which was in the process of being phased out. NYHS draws a diverse ethnic urban student population of color mainly from neighborhoods surrounding the school and upper Manhattan. The school is located in one of the poorest counties in NYC that is reflected in the overall economic background of the student population. According to the 2004-05 district report card 84 per cent of the students qualify for free lunch while 81 per cent in NYHS qualify for free lunch (New York City Department of Education, 2006a). Mostly students of color coming from African American, Latino, and African Diaspora backgrounds populate the school. The student population is made up of 45 per cent Black, 51 per cent Latino, 3 per cent White, and 1 per cent Asian and other ethnic groups (New York City Department of Education, 2006b). The Black and Latino populations data are not disaggregated into sub-ethnic populations, however, the school's 2004-5 report card lists two categories of more recent immigrants children attending the school as 3 per cent from Ghana and 2 per cent from Jamaica. The school's ethnic population is representative of the school district, however, the gender makeup is not. NYHS has 10 per cent male and 90 per cent female students attending, while the

district has 51 per cent females and 49 per cent male. This demographic was primarily due to initially advertising the school as specializing in nursing. The expanded themes (medicine and allied health profession) were added after the NYC high school application booklet was issued. The population of males in the first cohort of students partially reflects the percentage of males (6 per cent) nationwide entering the nursing profession (The New York Academy of Medicine, 2006). Nationally and globally nursing continues to be viewed as a female dominated profession. Despite, expanding its theme the school has not been able to significantly increase the percentage of males in the student population (New York City Department of Education, 2007). Because the school has not produced its first graduating class, it has very little achievement and no Regents examination data listed in its 2004-05 school report card. At the moment, the school seems shielded from having a long academic record that could generate either positive or negative status.

Diamond, Angel, Disaya, and Amber are all enrolled in a one-year chemistry course and are expected to take the New York State Chemistry Regents Examination at the end of the academic year in June. There is a significant focus on learning subject matter and holding students, teachers, and schools accountable for high levels of academic achievement through performance on state-level Regents examinations. Although most students taking Regent Chemistry in the district are expected to take the Chemistry Regents Examination at the end of the academic year, NYHS decided to give some students an extra semester to prepare for the examination. This decision was based on students' low to moderate success on the class examinations and mock Regents scores.

These students are expected to take the exam at the end of the fall semester of the following academic year. Diamond, Angel, Disaya, and Amber are enrolled in the Regents chemistry class and have been flagged by their chemistry teacher, Rey, to be in need of additional time to prepare for the exam. The science curriculum sequence is unusual for the school district. Typically students in the district in similar science programs take the Regents examination based on one-year science courses in the following sequence starting in the ninth grade: living environment, chemistry, and physics. Students at NYHS take non-Regents conceptual physics in the ninth grade and Regents chemistry and living environment in the tenth and eleventh grades, respectively. For Diamond, Angel, Disaya, and Amber, this translates into pursuing an advanced Regents High School Diploma. The science requirement for the New York State advanced diploma specify that students take a minimum of one year of living environment, one year of Chemistry, and pass the associated Regents examination for each course. There is significant priority placed on getting students to score above a scale score of eighty on all Regents examinations.

As discussed in part I, The Regents exam based curriculum is part of a larger effort in the United States, as well as New York State, to implement a standards driven educational system underpinned by standardized and high stakes testing. For Rey, this has meant teaching towards a standardized test. It has also meant offering twelve hundred minutes of chemistry laboratory instruction so students can accumulate enough laboratory credit hours to take the chemistry Regents. Although the New York State Regents examination system has been in place for the past century (Folts, 1996), the exams have

(only recently) become a central tool in the state to gain status and meet standardized curriculum goals in secondary education as mandated by the federal government. This status is cultivated from the student and teachers who work to achieve high grades and pass rates that then diffuse to the state and national levels. Congruently, this national agenda has trickled down to state, local school districts and classrooms that must conform to this policy agenda in order to be federally funded. This system creates a cycle of symbolic and monetary rewards that saturates classroom curriculum and encounters. Moreover, this policy agenda ignores and underestimates the need to understand how what students learn makes a difference in their lifeworlds. While there is a place for standardized testing, it is also important to understand how urban students of color are utilizing what they have learned to improve the quality of their social lives.

All four students did not take the Chemistry Regents at the end of their tenth grade year. The students were administered a mock Regents exam approximately one month before the actual examination was scheduled. Based upon the mock examination passing score of 65 or lower and moderate performance on the chemistry in-class examinations, Rey and the school administration recommended that the students wait until the following January to take the exam. The school organized and recommended that the students attend Saturday review classes during the fall semester. Diamond decided not to take the chemistry Regents exam and focused, instead, on passing the biology Regents exam at the end of the eleventh grade year. This meant she would not qualify for an advanced Regents diploma; however, by passing one science Regents exam she would still qualify for a regular Regents diploma. Angel and Disaya took the

January exam without consistently attending the Saturday classes and prepping for the exam. Unfortunately, both students failed the exam. They are both planning on retaking the Regents at the end of their senior year.

The implications for most students in Diamond's position is that continuing to focus on passing the Regents, in her case the chemistry Regents, has created a structure that constrains their participation to continue to learn chemistry in which they have an interest and that connects with their lifeworlds. Anticipated failure has become a resource in NYHS used to program students differently and place them on pathways to opt out of learning science. These pathways are imbued with negative emotional energy and contribute to the production of rituals of avoidance. When students express attitudes, such as "I am not good in chemistry" or "the exam really burnt me," they are articulating the inability to access and appropriate needed resources to be successful in learning science. As Tobin (2007) notes "with the vast array of teachers available to tailor curriculum to the needs of the students it might be that more could be done to recruit students to science rather than persist with an intense focus on exceeding a particular score on the Regents." If students are able to access, appropriate, and create more structures to help them develop additional level of understanding of scientific concepts, it is likely that they will engage in science more fluently.

Fields That Emerge

At the beginning of the class Rey started to give out instructions about the different phases of the laboratory activities. The dilution instructions were written on the

board. In order to get the class's attention he uttered, "I am only going to give the instructions once." Normally, a statement like this would create anxiety among students if they knew that they would be able to access the teacher(s) as a resource for instruction only once. Rey's statement did not elicit negative responses from the students. Throughout the lab class, the students did not hesitate to ask questions or for additional instructions. Both Rey and I were helpful and repeated instructions many times. As a new participant in the field, I became curious and wanted to discuss this in the cogenerative dialogue associated with the class. During the dialogue, it seemed that from sharing experiences (culture) in the chemistry classroom with Rey as a teacher for several months, the students knew not take the content of this particular utterance literally. They understood this was Rey's way of getting their attention. In this instance, Rey's utterance, became a bracketing ritual and part of the culture of the classroom field to get attention.

As the laboratory progressed, there were many instances where students of different racial and ethnic backgrounds were interacting fluently. Although there were a small number of males in the class (5 males and 19 females), they were not isolated in one group. All students are considered racialized minorities of color. Since Rey did not assign groups, and made adjustments only when a group had more than five students, students formed groups mainly due to friendships and prior encounters with each other. When I asked Angel why her group chose to work with each other, she said because they were close friends but sometimes they work with other students. Social and emotional affiliation across categories defined by ethnicity, gender, and age helped to sustain coordination and cooperation during the lesson. There were also breaches

(contradictions) in the flow of activity during the laboratory class (e.g., test tubes were broken, some students were asked to quiet down, two students who Rey perceived as too playful were asked to switch groups), students were consciously and unconsciously appropriating structures to regulate their learning and the emotional energy in the classroom. In a recent paper Roth and Tobin (2007) suggested that culturally different individuals not separated in space and part of the same activity system may not be disadvantaged in the recognition of emotion despite cultural differences.

The pH laboratory class occurred towards end of the second (spring) semester of a two-semester chemistry Regents course. The pH laboratory was part of the unit on acid-base chemistry and occurred during the second half of a double period of science instruction. During the first half of the double period, students worked together to create five-minute group presentations on how to calculate oxidation numbers. The vignette described in this paper was recorded during the 45-minute pH laboratory activity. The three-minute vignette is divided into three episodes. Although each episode is analyzed separately, together they foreground salient themes and encounters that provide coherence to the entire vignette. In order to present integrated themes I will often refer back and also forecast forward across all three episodes. The vignette was chosen to highlight student-group, student-student, and teacher-student interactions. Angel, Disaya, Amber, and Diamond chose to work together during both phases of instruction. They are very close friends outside of school and often choose to work together during group projects and laboratory activities.

At the beginning of the laboratory exercise Rey asked that I work with two groups adjacent to each other. He was concerned that these two groups might fall behind during the lab. He indicated that the students in these groups often chose to work with each other. He described members of each group as very sociable during laboratory exercises. During previous lab classes, he noticed that some of the group members would spend approximately ten minutes socializing within the group and with other groups before beginning work or talk pertaining to the laboratory activity. He felt that both groups spent too much time off task. I worked back and forth between both groups. My frequency of encounter with each group was mediated by how often members of each group called me over for advice or instances when I felt that I needed to make important suggestions. In essence, I became an ad hoc member of both groups. In this article, I focus on the group constituted by Angel, Disaya, Amber, and Diamond. This group along with the other five groups was nested within the larger field of the classroom.

Three fields, laboratory classroom, Angel's laboratory work-group, and the associated cogenerative dialogue, emerged as salient to this ethnographic study. All participants in the study were involved in each field. Emergent structures and associated culture helped to identify and characterize each field. Consequently, as participants entered each field they appropriated resources to enact culture to meet their goals and motives associated with each field. For example, participants in the class used their agency to form eight workgroups (fields) and continued to enact culture in appropriate ways in each workgroup to complete the laboratory assignment. Field boundaries among these groups and the larger classroom were weak and porous. Transitions across these

fields were easy and frequent. This was exemplified by the manner in which coteachers and students were able to move around and interact with other laboratory groups at will. Even though the students were able to select their own partners and move around with relative ease, Rey enacted culture (e.g., asking students for their progress and reminding them if they did not turn in their results they would receive a zero rating for their grade) to constrain the students to attend to the laboratory exercise. The associated cogenerative dialogue occurred on the same day during the students' lunch time several periods after the laboratory class. Students from Angel's group and Rey were invited to participate in the cogenerative dialogue. The cogenerative dialogue, however, was open to other students, teachers, and teacher-researchers who participated in the laboratory class. Although the laboratory class (along with nested workgroups) occurred at a different time and space than the cogenerative dialogue, culture originating from one field was readily enacted in and across temporal and spatial boundaries. For example, during the cogenerative dialogue Rey and the students began to ask additional questions about the indicator and simultaneously used gestures to pretend that they were holding the dropper or test tube in their hands. In the process of answering a question, Rey traced the shape the pH scale in the air with his fingers. It is important to note that even though this study focuses on culture originating from the three distinct fields mentioned above, culture originating from other fields was also enacted. Disaya and a teacher-researcher who did not participate in the laboratory activity became excited over a topic of conversation and gave each other high-fives to show synchrony during the cogenerative dialogue. During the laboratory class students could be heard in the background tapping and humming lyrics to hip hop and reggae songs.

Sustaining Productive Encounters in Laboratory Activities

Using Bracketing Rituals: What's happening here?

The purpose of the lab was to explore the chemical and visible color interactions of two different pH indicators, universal indicator and phenolphthalein, in basic and acidic media. The students selected their laboratory partners and were left to work on their own with intermittent support from Rey and me (Figure 4.1). Figure 1 shows three groups of students working to complete the laboratory activity. Members within each group interact and show mutual focus by leaning over and attending to the groups' system of test tubes. The students were encouraged to work in groups consisting of no more than five students. Rey and I often cotaught lessons. This was one of our first lessons we cotaught together in the laboratory classroom. During this lesson, Rey was the lead teacher and I provided peripheral support to Rey and the students. Rey circulated throughout the different groups and spent a lot of time near the demonstration bench in front of the classroom distributing chemicals and supplies (Figure 4.2). He interacted with each group at their workbench at least twice throughout the laboratory class. Rey usually entered the field of each group by asking: *What's happening here?* Posing this question while entering each field became a bracketing ritual to begin the interactions with members of the group. Bracketing rituals are enacted to increasing fluency and decrease the breaches in the flow of activity when initiating interaction. The students in each group would position their bodies to make room for Rey to enter their field. This encounter became very reminiscent of a football huddle where players on the team made room for the coach to enter the huddle (Figure 4.3).



Figure 4.1: Groups working on pH laboratory activity



Figure 4.2: Rey distributing laboratory material at his workbench in the front of the classroom



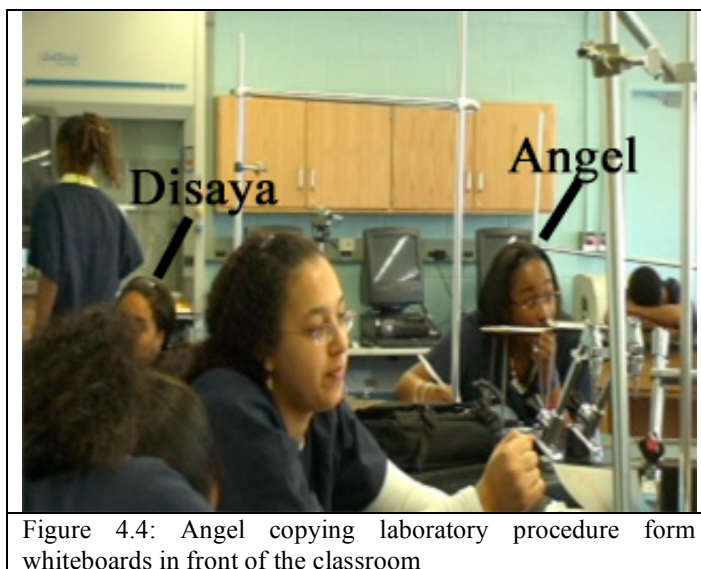
Figure 4.3: Rey interacting with a group adjacent to Angel's group in a group huddle

Orienting Resources: Prosody, Emotional Energy, and Solidarity

While Rey was attempting to settle the class down so that he could review the instructions for the laboratory activity, several students, including Diamond, were

walking around and socializing. Even though Rey had suggested that Angel's group might fall behind, I began to notice a level of cooperation and affiliation that allowed members of the group to weave in and out of discussions about their lives in the science class as well as other topics in their personal lives and not get too distracted. In fact, while Rey was introducing the lab activity and pointing to the different sets of instructions written on the board, Angel was writing down the notes and the other members of the group were beginning to negotiate when they would get a copy of Angel notes (Figure 4.4). Approximately 25 minutes into the 45-minute laboratory class Angel's group began to prepare the test tubes for the second time. They realized that what contributed to their previous serial dilution error was that they did not label each tube before placing it in the rack. I suggested to the students to get a wax pen from Rey to label the test tubes.

Reflecting back, if the students did not make a dilution error at the beginning of the test tube preparation phase, they would have finished much earlier. Their failure to keep up with other groups was a contradiction. Accordingly, I wanted to find out more about ways the students in Angel's group were creating and sustaining productive encounters.



At this point, the students were into the second phase of the pH laboratory activity. They had completed the serial dilutions needed to prepare the twelve test tubes that were then numbered and placed in increasing numerical order into a white test tube rack. The test tube labeled one had the most acidic medium (0.1 M HCl). The pH of the medium in each test tube increased as the tube number increased to the most basic medium in test tube twelve (0.1 M NaOH). The medium in each test tube was initially colorless. The students were preparing the series of test tubes so that they could get to the next step of adding three drops of the universal indicator in each tube. It was not until later during the cogenerative dialogue that Rey pointed out that the number of each test tube corresponded to the pH of the medium in each test tube (e.g., the medium in test tube seven had a pH of seven).

During Rey's third encounter with the group in the pH laboratory class, he asked the students about the color and the pH of test tube seven, "Where is your test tube seven? Where is your test tube seven? What did you put in your test tube seven?" The

students did not answer his questions; however, Rey answered his own question "No acid, No base, write that down. You need to remember that test tube seven is a different color from test tube one and test tube twelve." The pH and the content of test tube seven would become an important topic for discussion during the cogenerative dialogue. Below is a transcript of a vignette captured from the cogenerative dialogue. These transcripts were not time coded and focused on the content of the discussion.

Amber: Ok, so all the numbers- like one, two, three was pink; four was the only one that was yellow. What was in that? What it meant?

Angel: That was Na, sodium hydroxide

Rey: Which one

Diamond: Number 4

Rey: No

Angel: No, No, one to six was hydrogen chloride. We didn't put anything in 8no ummm number 7. So seven was neutral. Then from 8 to 12 was sodium hydroxide.

Amber: So why was four yellow?

Rey: That is a signal that your acidity is increasing

Amber: Oh!

Angel: Because in the middle seven is neural and if it goes down it will be further acid and if it goes up it will be more basic.

Rey: See, if you follow the procedure you get the best results.

Angel: We didn't know what to expect at first because normally when we do experiments the color of the liquid does not change

<<Five minutes later Diamond begins to ask about the color of the indicator.>>

Diamond: Ok, I have a question. Why is the umm what?

Amber: Indicator

Diamond: Green

Amber: Why was it green?

Rey: That is the original color in test tube seven

During the cogenerative dialogue(immediately following the class) the students started to lead the discussion about the range of colors they observed in the test tubes. We reviewed the results (Figure 4.6) they recorded to help recall the color observed in each test tube and make connections with the associated pH and color

properties of the universal indicator. Test tube seven was the internal control for the experiment (i.e., it was expected that the color of the medium in test tube seven was the same color as the universal indicator). At neutral pH the indicator did not change color. The students did not realize the significance of the color in test tube seven until we began to review the experimental results during the cogenerative dialogue. Towards the end of this part of the dialogue Rey indicated that to obtain the best laboratory results you should always follow the established protocol. Although there is some wisdom to this statement, Angel's statement captured the spirit of doing science the best "we did not know what to expect."



Figure 4.5: Class results displayed at the front of the classroom.

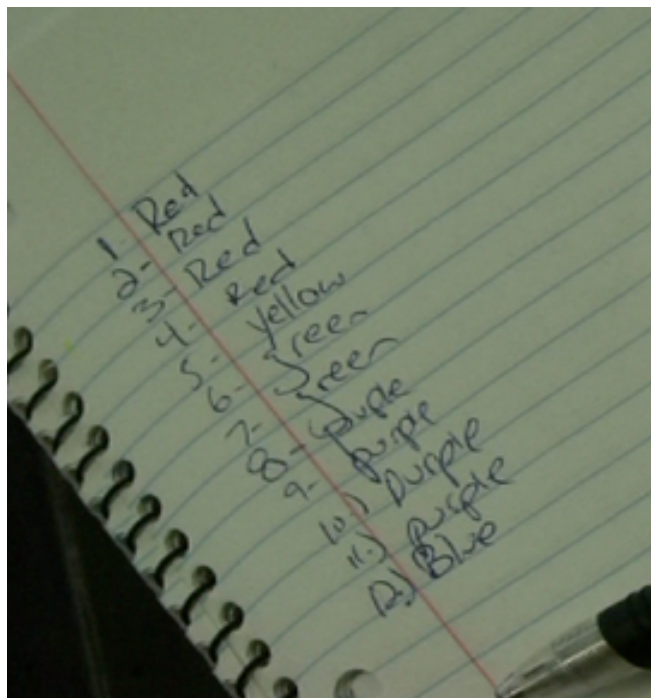


Figure 4.6: Angel's group results recorded as test tube number vs. color observed in corresponding test tube

Three Drops Vignette: Creating a Laboratory Ritual

Since Angel's group was one of the last to complete this part of the lab, they knew that the liquid in each tube was going to change color when they added the indicator. They also anticipated observing a range of colors. There was a lot of excitement and positive emotional energy that was building up in the classroom as each group realized correct results indicated by the correct range of color changes. As each group obtained the expected results they shout out with excitement. The color changes in the test tubes' media became an anticipated focal point that produced positive emotional energy that diffused throughout the class at varying times in the lab activity. This produced a classroom wide synchrony and entrainment that was initially slightly out of phase. All the student groups became focused on completing the experiment adding to the class's display of results. After each group obtained the correct results, the students in

that group were asked to display their test tube rack in the bench in front of the class. As each group finished, the racks were lined up next to the others, creating a train of test tubes with repeating color patterns. At the end of the laboratory class, all six racks representing each group were placed next to each other (Figure 4.5).

The *Three Drops Vignette* was selected because it illustrates how the group of students was able to produce successful encounters to improve their learning of chemistry. Students regulate learning by creating agency and structures (resources) that help to create positive emotional energy and sustain solidarity. Positive emotional energy and solidarity are necessary to increase and sustain fluent encounters. That is, encounters that are timely, anticipatory, and appropriate decrease the number of breaches in the flow of encounters and create productive learning environments. I present and interpret empirical evidence for solidarity, fluency, and emotional energy collected from the ethnography conducted during the pH laboratory activity described above. An array of evidence, including photographs, transcripts, prosody, and descriptive text, is presented in a coordinated fashion to support claims. Incorporated into the transcript are prosodic and descriptive data. Human beings display prosody, emotions, and gestures as part of praxis; in other words, they are not only used consciously and unconsciously but also pragmatically (subject to the purpose and stocks of knowledge at hand). Consequently, they are also forms of cultural enactment that can be observed, interpreted, appropriated, and accessed as resources by individuals as social life unfolds. Displays of prosody, emotions, and gestures become part of the structure within a field and are available for

participants to appropriate as resources to expand (or constrain) agency, create (a)synchrony, and build identity. Additionally, these resources are appropriated and accessed at the micro level of social life and therefore necessitate micro level analysis.

Prosodic markers, such as the production of alignment and misalignment of pauses, overlapping speech, pitch, and amplitude changes, are also signs of fluency, emotional energy, and solidarity. F0, also referred to as pitch, is the fundamental frequency of phonation. Gross and fine temporal structures associated with the parameters of F0 and speech intensity, such as short-term and long term variability, are correlated with stimulated emotions (Scherer, 1989). Minimum and maximum pitch levels and pitch contours, individually and in combination with speech intensity and gestures, convey emotional resources. Pitch contour (F0 contour) is graphically articulated by plotting F0 values over time. According to Scherer, emotions with high arousal and activity are characterized by increased F0 and F0 range, variability, and increased mean intensity. For example, anger is associated with increases in mean F0 and mean intensity, high frequency energy, and F0 contour patterns directed downwards. Joy and elation are highly associated with increases in mean F0 and intensity. Positive and negative emotions are embodied in speech, gestures, and rituals. The displays of these valenced emotions are also attached to the outcome of goals and motives. For example, earning a high grade on a high stakes examination can be associated with positive emotions and a smile. Prosody and associated body gestures provide structural coordination (social cues) experienced in action and chains of collective actions (activity). As such, prosody markers, body gestures, and speech content are coarticulated

and cocommunicated to produce resonance. For instance, overlapping speech, speakers completing each other's sentences, and counting together are examples of coparticipating in ways that create fluency and synchrony. These markers must be presented as part of a big picture (the enactment of social life). They cannot be interpreted and should not be presented in isolation of each other. Salient to this notion is social life that is captured during micro level analysis might be contradicted or affirmed during associated meso and macro levels of analyses.

Episode 1: Counting Drops as a Resource for Synchrony

Several weeks before the pH lab I had an opportunity to meet Rey for the first time in a research meeting. Rey had been video taping Angel's class for about three months. He started taping the group in the middle of the fall semester. During the meeting, Rey showed the research group the micro analysis that he conducted on a footage he captured from an earlier lab class. He prefaced his analysis with his concern about the increased length of time it took some students to settle down and focus on the lab. He felt that some students took too much time walking around chatting and socializing from one group to the next. He increased the footage played back at approximately quadrupled speed and focused on one student, who turned out to be in the other group Rey asked me to work with during the pH lab. He showed the student walking and socializing for approximately 20 minutes during a previous lab before attending to the lab activity. I felt, at the time, that it was compelling empirical evidence of something to discuss with the students.

Weeks later during the pH laboratory, I notice the same phenomenon with the student Rey pointed out and Diamond. What I also observed was that the students, especially Diamond, were socializing a lot but they were also gathering information about the progress of the other groups' experiments. Diamond alerted us that the liquid in the test tube was going to change color if we prepared everything correctly. We started to hear other groups' excitement as they completed the experiment and the media in their system of test tubes had the correct color range. The other group I was helping finished before Angel's group. When that group finished and showed excitement about their results, Rey come over to interact with them and showed emotional solidarity and injected positive emotional energy into the classroom by uttering, "Wow! What great results." At the end of the class, Rey asked the students "How did we get these good results?" The students yell out different answers: "by listening," "by working together." Although Rey, prodded them to say "following directions," I wanted to explore what I believe to be the glue that bound the class together in this activity: solidarity and keeping the threshold of collective emotional energy on the positive side. Prosody, speech content, gestures were good ways to look for the glue.

Sustaining Entrainment

The transcript⁵ describing the first episode of the *Three Drops Vignette* is presented below. The first episode opens with Disaya, holding the flask and medicine

dropper in her hands, getting ready to add the first three drops of indicator to test tube one. The participants appropriate the test tube rack and the medicine dropper as resources for mutual focus and encounters.

Episode 1

01 Amber: Please make sure its three drops on it girl ((talking to Disaya))

02 Angel: = ↑Yea, because you be doing something crazy
(0.23)

03 Rey: Ok, so what's happening here?
((rate of speech 8.2 SPS))
(0.26)

((Rey comes into the field placing himself between Angel and Amber))

04 Amber: We are about to add drops
((Quickly turning to make eye contact with Rey))
(0.30)

05 Rey: What test tube is that?
(0.33) ((rate of speech= 6.63 SPS))

06 Angel: Test tube One
(2.03)
((Rey then gestures with an affirming head nod.
The group receives Rey's approval to go ahead and

⁵I use transcription conventions employed by Roth (2005)

- [beginning of overlapping talk or gesture;
- = equal sign at the beginning of a turn indicates no appreciable gab between two speakers;
- (2.5) elapsed time in tenths of a second;
- :: colons indicate lengthening of the preceding phoneme, approximately one tenth of a second for each colon used;
- (db) sound intensity measured in units of decibel;
- (Hz) pitch measured in units of Hertz;
- ($\mu\text{Watts}\cdot\text{m}^{-2}$) power in the air measure in units of micro irradiance (Watts/m^2)
- a dash indicates sudden stop in talk;
- ↑↓ arrows indicate shifts to higher or lower pitch in the immediately following utterance part;
- (()) double parentheses (italicized) are used to enclose comments and descriptions.

add three drops to the first test tube. Disaya begins to
add three drops to the first test tube.))

07 Angel: One (starting to count)

08 Amber: =one (1.97) two(1.45) three(0.25) next
(0.64)
((Amber leans forward and begin counting the three drops
Disaya is putting into the test tube
one.))

09 Amber: one(1.33)two(0.89)three(0.11) next ((Amber is counting the
three drops that Disaya is putting into test tube two.))
(0.85)

10 Disaya:=↑Good Job
(0.37)

11 Amber: <<next> (0.06) <<next>(0.17)<next>>

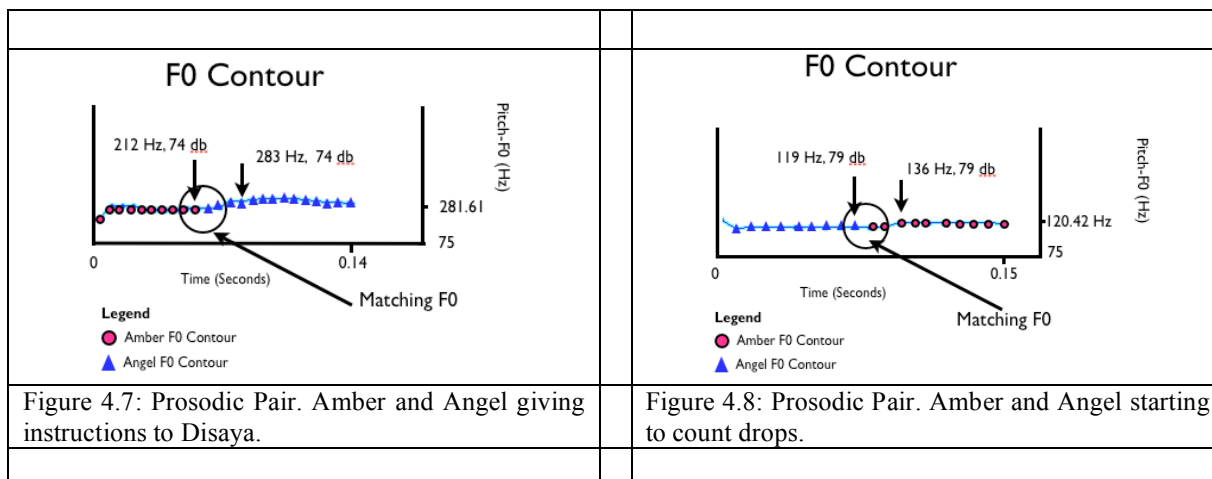
Throughout the vignette emotions, gestures, humor, rituals, and body orientation are used as resources to create and sustain positive emotional energy, mutual focus, and entrainment (i.e., widespread solidarity). Prosody and the use of the equipment are also used to maintain mutual focus and entrainment. At the beginning of this episode, all four students are huddled together to form a circle around the test tube rack. They are all resting their arms on the workbench and simultaneously leaning over to focus on the test tube rack. The only student who is initially out of synchrony is Diamond who seemed to be taking a break from interacting with the group by placing her scrub over her head and looking down inside the scrub for approximately 10 seconds. This interrupts the group's solidarity for a short period of time. The first two turns at talk occur without any appreciable silence between each turn. In the first turn at talk, Amber utters "Please (76 $\mu\text{Watts}\cdot\text{m}^{-2}$, 338 Hz, 77.8 db) make sure (10.9 $\mu\text{Watts}\cdot\text{m}^{-2}$, 372 Hz, 80.5 db) its three drops on it girl (62 $\mu\text{Watts}\cdot\text{m}^{-2}$, 271 Hz, 77.1 db)" to remind Disaya that she should only add three drops to each test tube. The emotional energy in the beginning of the episode is filled with moderate intensity (hopeful) instructive responses characterized by

rising and lowering pitch inflections and intensity accompanied by the introduction of power in the air (energy per unit time). According to Turner (2002), this is characterized by emotional sources of satisfaction-happiness mixed with aversion-fear. This mixture of emotion is brought about, in this instance, by the group's concern that Disaya will not add the correct number of drops to the test tubes. Simultaneously, however, group members provide Disaya with encouragement. Amber articulates respect by beginning her first turn at talk with the word "Please." This also allows Amber to earn respect (symbolic capital) and create positive emotional energy (cultural capital) while delivering instructions to Disaya. Earning and showing respect is a key element in maintaining resonance and fluency during teaching and learning activities (Tobin, 2006).

Prosodic Pair

Angel appropriates turn 02 at talk by uttering "Yea" to show agreement with the content of Amber's remarks. The power in the air increases from $62 \mu\text{Watts}\cdot\text{m}^{-2}$ on "giRL" at the end of turn 01 to $86 \mu\text{Watts}\cdot\text{m}^{-2}$ on "Yea" at the beginning of turn 02. At the end of turn 02, the power in the air decreases to $73 \mu\text{Watts}\cdot\text{m}^{-2}$. Similarly, the mean intensity and the frequency increase on "girRL" from 77.2 db to 79.2 db and from 271Hz (min=208, max 295) to 292 Hz (min=261, max 323) on "Yea", respectively. Amber's mean pitch in turn 01 is 287 Hz (min=281, max =327,) while Angel's mean pitch in turn 2 is 352 Hz (min= 253 Hz, max=498 Hz). The utterances of "giRL" by Amber at the end of turn 01 and the "Yea" by Angel at the beginning of turn 02 produces prosodic complementation indicating agreement and alignment in collaborative action (Roth & Tobin, 2007). Prosodic complementation occurs when the first pitch contour, that is

complete in itself, matches the second contour complement both in content and prosody (Figure 4.7). The content of both complements cautions Disaya and are associated with matching pitch. In this situation, the increase in power in the air, speech intensity, and matching of frequency during the change of speakers is an indication of enthusiastic solidarity due to synchrony and entrainment. Amber's reminder provides female camaraderie and encouragement to Disaya, while Angel's reminder and encouragement is couched in more humorous terms that imply references to prior encounters and perhaps affiliation. Normally a statement such as "you be doing something crazy" would be construed as an insult. In this case, however, it is talk between insiders and construed as advice that attends to the goals and motives of the encounter. Both turns at talk also signify an incumbency to the field created by the group. The mechanical solidarity (brought about by voluntary grouping requested by Rey at the beginning of the laboratory class) is evident, but also present is emotional solidarity established by prior encounters and rituals.



A prosodic pair is also evident in turns 07 and 08 (Figure 4.8). In this situation Angel and Amber produce overlapping speech and begin to count the first drop being

delivered to the first test tube. Angel's mean frequency in turn 07 at talk is 112 Hz (min=102, max =124) while Amber's mean frequency in turn 08 is 132 Hz (min=112 , max=139). Both turns at talk occurred at 79.1 db with $57 \mu\text{Watts}\cdot\text{m}^{-2}$ of power in the air. These complementary turns at talk exemplified resonance, synchrony, and fluency. The initiation of counting started simultaneously with the anticipated delivery of the first drop. Counting drops became an appropriate way to make sure that exactly three drops would be delivered to each test tube attending to the goals and motives of the group. Matching prosody markers in turns 07 and 08 showed resonance in the delivery and production of both phonation and speech content. In this situation, matching prosody became an important resource to avoid an obvious struggle over who would continue to count. Angel conceded and allowed Amber to take on the role of counter. Matching prosody and speech content in over lapping speech is a way to unconsciously negotiate turn at talk and in this case also role. What is also observed is that although there may exist pre-configurations of affiliation, new roles can be negotiated to attend to unfolding goals and motives.

Rey is Accommodated




As the laboratory progressed, Angel's group began to coordinate their encounters and build mutual focus to attend to the motive of successfully completing the lab. Even when members of the group wandered off, they still maintained emotional solidarity and group affiliation by pointing to their group when they were asked what group they were in and returning to group to get progress updates. While Angel continued to write in her notebook, Diasaya and Amber were inspecting and counting the test tubes (Figure4.9).

Angel became increasingly organized around the laboratory activity and became a resource for keeping track of each step the group completed.

Angel appropriated the role of preparing the serial dilution and asked Amber and Disaya to get missing materials from Rey's workbench in front of the classroom. Amber was asked to get a missing test tube and to replace a test tube that was leaking before Angel began to prepare the dilutions. Disaya got the flask with the indicator after the serial dilution was prepared. Diamond was initially out of synchrony with the group. She sat in a chair off to the side of the workbench, however, maintaining her affiliation and solidarity with the group by gazing at and interacting verbally with the group. Diamond was constantly distracted by her cell phone and left the room for approximately six minutes in the middle of the dilution preparation. When Diamond came back into the classroom, she was actively engaging the members of her group while standing at the workbench increasing group synchrony, emotional and mechanical solidarity, and the potential for mutual focus.

As the group reached the step to start adding the three drops of indicator solution to each test tube emotional and mutual focus continued to increase. I noticed that students in other groups became very excited during this step in the laboratory procedure. This was an opportunity to find out how roles were going to be appropriated and negotiated in Angel's group and how mutual focus, solidarity, and entrainment were going to be embodied by the group members in order to complete the laboratory exercise successfully. Disaya positioned herself on one side of the rack to start adding drops while

Amber position herself on the other side. Diamond sat on a tall workbench chair and positioned herself between Disaya and Amber directly in front of the rack (Figure 4.10). Angel started to lean over on the other side of the workbench facing Amber, Disaya, Diamond, and the test tube rack (Figure 4.11). I walked over with the camcorder, positioned myself between Disaya and Angel, and backed up so that everyone was visible in the camcorder view screen (Figure 4.12). Rey, also joined the group and started to gaze at the test tube rack. At this point, there were six members of the group mutually focused on the test tube rack and poised to appropriate structures to enact emotional solidarity and entrainment.

		
<p>Figure 4.9: Angel, Disaya, and Amber become organized around the laboratory activity (time = 0 minutes)</p>	<p>Figure 4.10: Diamond rejoins the group (time= 6 minutes)</p>	<p>Figure 4.11: Rey joins the group (time = 11 minutes)</p>

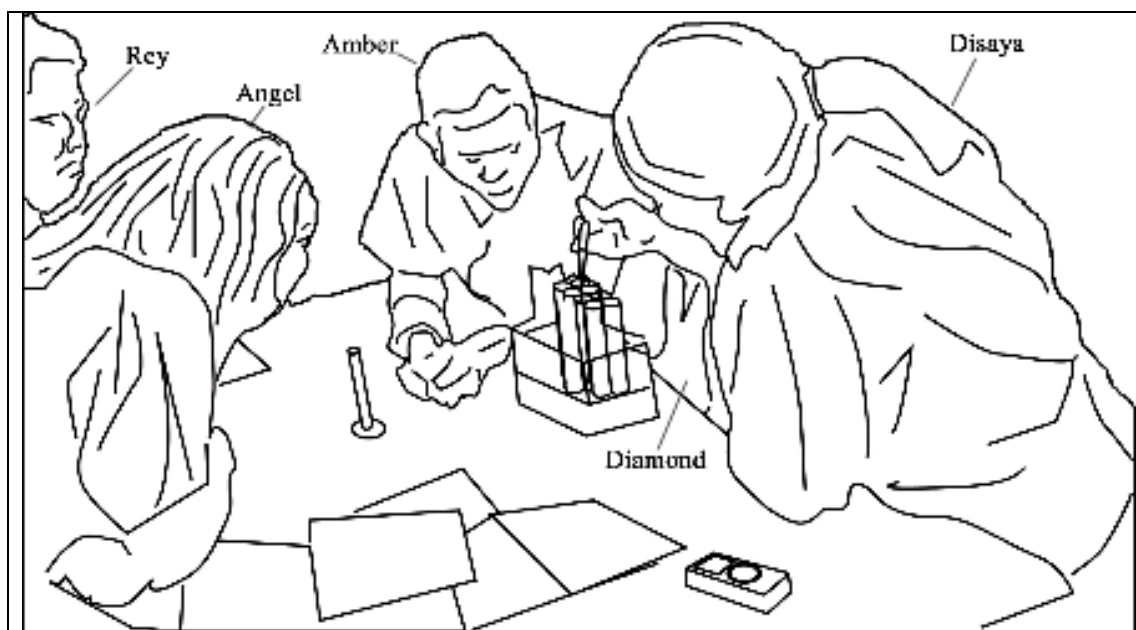


Figure 4.12: Angel's group and Rey entrained and mutually focused by leaning forward and gazing at the test tubes while Disaya is adding three drops to the first test tube.

In this classroom, the structural field boundaries surrounding the student groups are weak and porous. Students in the focus group allow students from other groups to gain access with relative ease. Across groups, the students gain information and interrogate each other fluently about many topics, including the lab activity, in many different ways. Alternatively, when Rey wants to interact with a group of students and interrogate them about the lab activity he utters this bracketing ritual, *What's happening here?*, in order to gain information and not cause intentional disrespectful breaches in the flow of activity. As mentioned above, earning and showing respect is an important aspect of keeping encounters fluent, particularly with students of color, during science classroom activities. Employing rituals is a primary way of showing respect, unless the ritual is meant to show intentional disrespect. Even when the ritual is meant to show intentional disrespect, the response to the disrespect might be ritualistic in nature. Inherent to the deployment of rituals is the acknowledgement of the other in a manner

that communicates the understanding that “I see you.” The other can be acknowledged by deploying a ritual that communicates and acknowledges that I see you and will show you respect or disrespect. These modes of ritualistic communication can take the forms of emotional responses, gestures, and haptic responses.

Emdin (2007) maintains that students and teachers often enact inside the classroom rituals that are created outside the classroom. These rituals, when aligned with the goals and motives of the classroom activity, should not be dismissed or truncated. For example, Emdin describes how a student was able to suggest productive ways of engaging a classmate in a conceptual physics class by using rituals that both classmates developed out of school while playing a particular video game. Rituals should be afforded with other productive ways of interacting in the classroom to help structure fluently and infuse respectful interactions in science classrooms.

Although Rey is not part of Angel's group, his status as the teacher allows him to gain access to the group with relative ease. He helps to structure his entry into the field in turn 03 by uttering to the group “Ok, so what’s happening here?” at an average rate of speech (ARS) of 8.2 syllables per second (SPS). Rey uses this phrase as a bracketing ritual to signal that he is ready to engage the group by asking for a progress report. The students in the class are aware of this ritual. He repeats this phrase at least three times at an ARS of 6.1 SPS throughout the laboratory period signaling that he is ready to engage one of the groups in the classroom. Field structures that characterize Angel's group change to accommodate Rey's entry. Angel shifts slightly to physically accommodate

Rey. As Rey enters the field, he begins his utterance by matching the intensity (79.2 db) of the previous speaker but begins his turn at talk at a lower pitch and with lower power in the air ($67 \mu\text{Watts}\cdot\text{m}^{-2}$). The F0 on "crazy" at the end of Angel's turn at talk (turn 02) is 311 Hz, while the F0 on "Ok" at the beginning of Rey's turn at talk (turn 03) is 220Hz, while the F0 and intensity at the end of his turn at talk on "here" is 215 Hz and 79.0 db, respectively. His mean pitch during turn 03 at talk is 233Hz (min=198, max=262). In turn 05, Rey slows his ARS from 8.2 SPS (in turn 03) to 6.6 SPS (near his normal ARS of 6.1 SPS). The data presented here confirm Roth and Tobin's (2007) findings that teachers in a non-conflict classroom situation tend to speak at a matching (or lower) intensity and pitch range and normal ARS.

Rey and Amber structure their ARS for different purposes at hand (pragmatically) associated with the same goal. Rey's increased ARS in turn 03 is partly structured by the relatively short amount of time remaining (< 15 minutes) to complete the laboratory activity. Angel's group was the last group to complete the experiment. Rey wants to engage the group at a rapid pace so that they can complete the assignment before the end of the class period. Similarly, in order not to get too distracted by Rey's question and lose mutual focus, Amber quickly turns her head to make eye contact with Rey and asserts (turn 04), "We (279 Hz, 78.0 db) are about to add drops (226 Hz, 80.1 db)" at an ARS of 11.2 SPS compared to 4.5 SPS in turn 01. Her mean F0 and intensity in turn 04 at talk are 279 Hz (min=213, max=322) and 80.3 db. Amber's assertive expression placed more power in the air ($106 \mu\text{Watts}\cdot\text{m}^{-2}$); however, it did not signal challenge or annoyance (i.e., "heating up") because the F0 decreased and the intensity was slightly lower when she

began to answer Rey's questions. She quickly regains mutual focus and turns back to looking at the rack. Simultaneously, Diamond appropriates Rey's presence (capital as teacher and evaluator) as a resource to reinforce group solidarity by uncovering her head and engages the group again. Rey's entry into the field does not decrease the emotional energy but detracts from the easygoing display of camaraderie among the female students. As Rey enters the group, he focuses on the system of test tubes in the rack and does not make much eye contact with the students in the group. In turn 06, after Amber indicates that the group is adding the drops to test tube one, Rey gestures with an affirming nod to go ahead. At this point, Rey and the members of the group are all mutually focused on the medicine dropper and the first test tube in the rack. The system of test tubes is imbued with emotional energy. The group encounters, emotional valence, prosody, and speech content are structured by what happens to the test tubes.

Resonance and Synchrony: Equipment Manipulation and Prosody

As shown above, prosody and speech content can be used as tracers of solidarity, fluency, appropriation of material resources (including humans), and referents that indicate the content and trajectory of encounters. For example, during turns 08 and 09 Amber leans forward to count the three drops delivered in the first two test tubes. Her normal ARS, 4.5 SPS in turn 01, slows down considerably into a range of 0.6 to 0.9⁶ in order to be in synchrony and resonance with the mechanical delivery of the drops from the dropper being physically manipulated by Disaya. What is even more striking is that Amber's ARS increases from 0.6 SPS in turn 08 to 0.9 SPS in turn 09, approximately

⁶ Measured during the counting sequence "one, two, three"

matching the increased average rate of drop (ARD) of 0.6 DPS⁷ (turn 08) and 1.0 DPS (turn 09), respectively. As Disaya's use of the dropper becomes fluent, the ARD increases as indicated by Amber's adjustments in counting (ARS). In turns 08 and 09, Amber retains the turn at talk at the end of the counting sequence by quickly uttering next. The time between uttering the words "three" and "next" is less than 0.5 seconds in both turns at talk. Here Amber accommodates her ARS in order to maintain fluency in instructing Disaya to move ahead to the next test tube. By turn 12, in episode 2 below, Amber's count (0.9 SPS) remains in correspondence and fluent with ADR of 1.0 DPS in test tube 3.

According to Tobin (2005a), pauses in speech production of 0.5 seconds or more are also resources to change speakers. It is expected that the pauses between the words the speaker is producing is likely to be less than 0.5 seconds in order to retain the turn at talk in a fluent manner. During talk, breaches in fluency can occur if the speaker is unexpectedly interrupted between the productions of words less than 0.5 seconds apart. Longer than usual pauses (>0.5 seconds) can also be used to maintain synchrony and fluency. For example, in turns 08 and 09 Amber uses longer than usual pauses between each word during the counting sequence to create synchrony and resonance. The content of Amber's utterance in turns 08 and 09 also exemplify solidarity. Amber's choice to count in order to make sure Disaya did not add too many drops shows an affiliation to the group and Disaya (i.e., Amber was attending to the group's motives and goals). This synchrony continues until another student from an adjacent group distracts Amber from

⁷ DPS = drop per second

counting drops being delivered to test tube six. Amber's counting creates a structure to initiate entrainment later on in the vignette.

Good Job: Infusing Positive Emotional Energy

As expected, the medium in test tube one changed color from colorless to dark pink as the first two drops are added. This initial result generated emotions of enjoyment embodied by synchronous smiles and eye contact between Amber and Disaya. The students are expecting that the medium in each test tube will change color. Rey is still looking on and has not commented verbally or interrupted the process of adding the drops. Rey's silence provides a signal to the students in the group that the procedure they followed, so far, yielded the correct results. In turn 09, Disaya lifts her head out of her focal position and yells out "Good Job." The frequency on "Go"od is 515 Hz and decreases to 206 on J"ob." This shows large variability in F0 signifying excitement. The mean F0 between subsequent speakers increases from 242Hz (min=256, max=280) on "next" in turn 09 to 305 Hz (min=277, max=334) on "Good Job." There is also an increase in the power in the air from $67 \mu\text{Watts}\cdot\text{m}^{-2}$ at the end of turn 09 to $106 \mu\text{Watts}\cdot\text{m}^{-2}$ in the beginning of turn 10; however, there is a slight decrease in intensity from 79.4 db to 79.1 db. These prosody markers show that Disaya used her turn at talk to introduce more power in the air and spoke over Amber using a higher frequency but maintained the same intensity as Disaya. Disaya's turn at talk was also anticipatory because she was able to show excitement and associated gestures in between adding drops. In this way, her excitement did not detract from her role. The outburst of positive emotional energy (excitement) diffuses throughout the group. The other members of the

group also lift their heads slightly in unison to signify solidarity. After this encounter, Rey left Angel's group to answer a student's question from another group. Amber appropriates the next turn at talk and utters "next, next, next" at a noticeably increased ARS of 2.5 SPS compared to her ARS of 0.9 SPS in her previous turn at talk. She also matches Disaya's pattern at talk in turn 10 by producing a high F0 (434 Hz) on the first "next" and decreasing F0 on the second (301 Hz) and third (377) utterances of "next" to come within her normal mean pitch range of 303Hz (min=207, max= 385). Here again is an example of the group members attending to the goals and motives of the group (i.e., to learn chemistry and successfully complete the laboratory assignment). Disaya's production of positive emotional energy contributes to the solidarity of the group, while Amber's utterance in turn 11 helps to redirect the burst of positive emotional energy towards supporting Disaya's role of adding drops and maintaining entrainment.

In episode 2 (turn 12), Amber retains her role and, in the process, continues to synchronize her count with the drops added to test tube 3 by Disaya. In turn 13, Angel begins to count again. This time she attempts to synchronize her count with both Amber's ARS (1.1 SPS) in turn 14 and Disaya's ARD (1.0 DPS). Angel's ARS in turn 13 is 0.9 SPS. Angel begins 0.25 seconds before Amber begins to count and the duration (time at talk) on utterances "one"(140 Hz, 78.2 db) and "two" are 0.99 seconds and 0.67 seconds, respectively, with 0.79 seconds between utterances. In contrast, Amber's duration on utterances "one"(133Hz, 78.0 db) and "two" in turn 14 are 0.58 seconds and 0.23 seconds, respectively, with 1.01 seconds between utterances. These markers show that Angel tried to structure her ARS during her turn at talk to match Amber's ARS and Disaya's ARD. Angel was out of synchrony on "one" and became in synchrony on "two".

If we coordinate the time frames in turns 13 and 14, Angel started to utter "two" at 1.78 seconds and Amber started to utter "two" at 1.84 second. The time difference decreased from 0.25 seconds on "one" to 0.06 seconds on "two". Angel came into synchrony with Amber and Disaya by adjusting her pause between utterances, duration on each syllable (in this case word), frequency (212 Hz) and intensity (81.3 db). These markers exemplify emerging prosody pairs in overlapping speech.

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(in this case word), frequency (212 Hz) and intensity (81.3 db). These markers exemplify emerging prosody pairs in overlapping speech.

Episode 2: Ahhhhhhhhhhhhh

12 Amber: one(1.08) two(1.41) three(0.08) next
((counting the drops Disaya is putting in test tube 3))
(1.52)

13 Angel: one (0.79) [t:w:o
((Angel begins to synchronize her
counting with Amber and the delivery of drops to test tube
4 and Ambers count (ARS)))
(0.25)

14 Amber: one(1.01) [two
((Amber begins to synchronize her
counting with Angel and the delivery of drops to test tube
4))

15 Amber: ↑Ahhhhhhhhhhhh ((Amber is simultaneously
swaying her body. Amber's utterance and sway captures
Nicole's attention))

16 Disaya: Shut up ((Utterance while putting the third drop in test
tube five))

17 Amber: o:n:e::t:w:o- ((Amber and briefly interrupted by
Nicole who positions herself over Amber and Diamond
shoulders.))

The entrainment and positive emotional energy associated with the successful progress of the experiment and encounters lead Amber to produce a high burst of positive emotional energy (elation) accompanied by swaying of her head and hips in turn 15. The power in the air increases from 71 $\mu\text{Watts}\cdot\text{m}^{-2}$ in turn 14 to 99 $\mu\text{Watts}\cdot\text{m}^{-2}$ in turn 15. The duration of Amber's utterance ("Ahhhhhhhh") lasts for 1.82 seconds, beginning at 359 Hz (82 db), peaking at 678 Hz (78.3 db) 0.67 second, dipping down to 223 Hz (78.6 db) at 0.72 second and ascending again to 665 Hz (77.7 db) and ending at 322Hz (76.0 db). This is a classic characterization discussed by Scherer (1989) of high F0 coupled with increases in F0 and F0 range that correspond to an intense display of positive emotional

energy. Amber's utterance in turn 15 injects an increase in the net positive emotional energy into the field and attracts the attention of Nicole, a student from an adjacent workbench. Diaysa appropriates the next turn at talk and utters "Shut up" (160 Hz, 74.3 db) to Amber. Because the content of Diasya's utterances combined with prosody markers (lower F0 and intensity) were below Amber's in the previous turn at talk, they did not show disrespect to Amber but refocused Amber's burst of positive energy back into maintaining entrainment (adding and counting drops). Amber begins to count the first two drops in test tube six, but gets distracted in the process of making room for Nicole. Nicole positions herself between Amber and Diamond and adds to the group's mutual focus and entrainment.

I Want to Do Blue: Defusing Conflict and Maintaining Science Fluency

Prosody markers can also be used to track the heating up and cooling down of a potential conflict. In episode 3 the students use prosody and humor to cool down a potential conflict, maintain solidarity, and simultaneously increase net positive emotional energy. Throughout the first two episodes, Diamond is entrained gazing intensely at the test tube rack. She is also actively observing the progress of the experiment. She is positioned between Disaya and Amber, sitting down almost at eye level with the test tube rack on the workbench. Angel appropriates turn 18 at talk in episode 3 and suggests that Diamond add drops to the remaining three test tubes. Diamond appropriates the subsequent turn at talk and utters "Blue, I want to do blue" while reaching out and using her thumb and pointer fingers to mimic squeezing drops from the dropper. Diamond displays excitement characterized by high mean F0 (493 Hz, min 428, max=594) and large F0 range accompanied by increase in the power in the air $90 \mu\text{Watts}\cdot\text{m}^{-2}$. The

content of Diamond's utterance is fluent both in terms of the flow of conversation and pH chemistry occurring in the system of test tubes. She anticipates correctly that the last three test tubes contain the most basic media and will turn blue when the indicator is added. In a timely and appropriate manner, both Diamond and Amber indicate that this would be an ideal moment in the experiment to trade roles and allow Diamond to add drops. Disaya appropriates the next turn at talk and utters " \uparrow No"(mean F0=342 Hz, min=272, max=416) associated with $144\mu\text{Watts}\cdot\text{m}^{-2}$. The F0 and intensity on " \uparrow No" starts at 290 Hz and 74.0 db and rises at the end to 412 Hz and 82.1 db, respectively, showing an increased F0 and F0 range. Here Disaya is challenging the request to trade roles. Diamond displays a frown in response to Disaya's " \uparrow No" and the net positive emotion energy and entrainment decreases in the field. The decrease was not enough to completely dissolve the group solidarity and entrainment. Before the situation got heated up, Angel appropriates the next turn at talk and repeats the request to exchange roles at a lower F0, F0 range, and intensity—coming in below Disaya. Disaya yields and hands Angel the flask and dropper. Amber and Angel introduce humor by giving exaggerated examples while reminding Diamond to only add three drops. The injection of humor results in an increase in net positive emotional energy.

Episode 3: I Want to Do Blue

18 Angel: Let Diamond do the rest of them
(1.07 sec)

19 Diamond: Blue, I want to do blue ($90\mu\text{Watts}\cdot\text{m}^{-2}$, 493Hz, 77.7db)
((Disaya is finishing adding drops to test tube 8. Diamond's hand is reaching out as though she has the dropper. She begins to reach out to receive the dropper))
(0.46)

20 Disaya: \uparrow N"o"
(0.35)

21 Angel: Let Diamond finish doing it?
(1.48)

22 Amber: Uh: wait we have three tubes?
((Disaya gives the flask containing the universal
indicator solution and dropper to Diamond))
(2.75)

23 Amber: Remember three drops miss
(0.73)

24 Angel: Three okay not seven or eight
(0.09)

25 Amber: Not thirty-seven three
(0.03)

26 Angel: three

Conclusion

In a context of increasing levels of immigration associated with different streams of immigrant groups into NYC and the Bronx, networks of disseminating culture are created that penetrate fields nested in institutions, particularly institutions of education. In the case of the Bronx, the agglomeration of macro structures, such as hyper segregation associated with poverty, career opportunities, and educational policies, becomes instrumental in structuring the lives of the youth associated with these networks. Similarly, the culture produced in these networks is often mapped into existing ideology and mainstream imagery aligned with deficit perspectives. For instance, policies that create regiments of high-stakes testing are being conflated with policies that propose to help students and their families living under the poverty line take responsibility for their situation. Articulated in these types of policy agendas are notions that attempt to sublimate and control cultural activity. As such, at the root of the NYC's educational system exists an ideology of control whereby those in authority dictate what will and will

not be done, and when and how resources will become accessible. Yet, status quo efforts, such as exams to assess student promotions, school accountability, and over all success, create contradictions that divert attention from creating opportunities to learn, and instead create the continuance of failure. For instance, when NYHS administrators selected students to defer from taking the chemistry Regents, a situation was created for the students in the study to avoid structures to continue to enact interstitial culture in order to learn chemistry successfully. The school's motivation to the decrease of the school's Regents pass rate reported to the district office by not allowing students to sit for the exam if they predicted they might fail. The second fold motivation was to help students prepare for the exam by giving them more time, but in effect this activity created structures for students to opt out of learning more chemistry. Diamond decided not to learn more chemistry and pursue a career path to become a social worker because the course of study did not require any additional chemistry classes. Angel and Disaya both took and failed the chemistry Regents the following semester. They admitted avoiding new ways to learn chemistry related to the exam because they were overwhelmed with new course work from other classes and were unable to attend Saturday review classes consistently. Although the students were not able to access enough resources to be successful on the Regents, they were able to create culture to successful learn concepts associated with the pH laboratory class. What this study showed is that when students are able to access and enact interstitial culture in ways that create solidarity and success, teaching and learning chemistry is improved.

Solidarity is part of cultural enactment; consequently, it is constantly being produced, reproduced, and transformed in a dynamic manner. This chapter illustrates how all four students were able to 1) successfully coordinate their encounters by appropriating capital, 2) create agency and structures associated with positive emotional energy that produced solidarity and improve science fluency, and 3) create resources to enact interstitial culture while retaining difference. Structures of the laboratory were appropriated with culture originating from fields outside the laboratory as well as culture produced in the laboratory thereby creating encounters as sites where interstitial culture can form and flourish. The theoretical framework constructed in part I of this chapter provides a lens to understand the processes by which students produced, reproduce, and transform culture to create success in teaching and learning of chemistry.

Emotions are a central part of maintaining solidarity and understanding the student-student and teacher-student classroom encounters. Even when negative emotions surface, if there is enough net positive emotional energy to offset the negative emotional energy, classroom participants are still able to maintain solidarity and attend to goals and motives. The four students positioned themselves not only to maintain mechanical solidarity but also maintained a threshold of emotional solidarity. For example, students were able to inject humor and create instances of respect while providing directions and coaching each other in appropriate ways to conduct science. In addition, the students used terms in their utterances as a way to explain, characterize, or predict other's actions or how they might act in a given encounter. When Amber cautions Angel to only add three drops in turn 23, she not only exaggerates what not to do, e.g. "Not thirty-seven"

drops, but also uses terminology originating from outside the classroom by referring to Diamond as "miss." What we should notice here is that the intersection of cultural resources creates interstitial culture that allows students to produce success in science laboratory activities. In addition, cultural resources, such as rituals and prosody, intersect across a series of schema and practices that come together in varied social and cultural settings to foreground the notion of agency|structure and agency|passivity.

Interstitial culture is also characterized by the creation and recreation of identity associated with roles appropriated by individuals. When different social configurations get enacted, e.g., exchanging roles, there exists a nexus of capital and structural resources that aggregate to form interstitial culture. As such, interstitial forms of culture become the bases for the emergence of shared culture and solidarity that can be used for successful encounters across boundaries of difference. Interstitial culture takes traction because the culture produced creates fluency and micro successes that are imbued with positive emotional energy. These micro successes are mapped into rituals that attend to the purpose at hand. For example, in episode 1 when Angel began the forming ritual of counting drops, it traced micro successes after each drop was added and prompted the focus on the next test tube. Angel used her agency to appropriate the role of counting drops and in turn created additional resonance structures to build success and solidarity. In this role, she created an identity as an attentive and competent chemistry student learning chemistry in the laboratory. The successes were imbued with positive emotional energy and aggregated as resources that were appropriated by Amber and the rest of the group members. In episode 2 turn 15 the outburst of collective effervescence

characterized by Amber's utterance of "Ahhhhh↑" along with smiles and affirmative head nods from the other members of the group increased the power in the air associated with positive emotions and increased solidarity.

Although Amber creates an identity of a good chemistry student, she is also inscribed as a weak chemistry student by Rey and other administrators because of her low exam scores. This creates a contradiction. Amber's identity as a successful science student during the pH laboratory activity is mediated by contributions from her successful participation associated with the activity and narratives of successful students set up by the educational system. As such, the success of rituals used to conduct science, has implications for students' identity as science learners, as well as macro structures that saturate these encounters. The implications articulate a need to develop and change macro narratives that align with structures that decrease students' agency and set them up for failure.

Rey also uses bracketing rituals associated with the classroom to guide the initiation of encounters with each student group in the laboratory. Although structured by time and the need to qualify students with enough laboratory credits to take the Regents, he matches his rate of speech with the students' rates of speech. This helps to avoid a perceived rush and agitation that may cause negative emotional energy and disrupt the productive exchanges between him and the students. As such, prosodic markers serve to define forms of cultural enactment that create interweaving and recognized means of addressing and negotiating power. This chapter also suggests that the display of body

gestures coordinated with prosody markers, such as pitch, intensity, and variation in utterances, are major resources for tracking emotional valence and solidarity. Human beings use prosody pragmatically as part of a repertoire of nonverbal communication to orient the purpose at hand. Increased pitch level and intensity combined with utterances that signal resistance or challenge correspond to the "heating up" of situations, while a lowering or matching of pitch and intensity are signals of nonverbal repair rituals corresponding to a "cooling down" situation. This study also found that variation and range of pitch, intensity, and duration of utterances, and the production of power in the air, are used in combination to communicate intense emotions without introducing conflict. Prosody, the content of speech, and body gestures embodied, as rituals are appropriated as resources and define modalities that set the rules of engagement. For example, when Angel advocated a second time for Diamond and Disaya to switch roles, she increased her pitch without increasing the range and screaming (increased intensity). This allowed Angel to be assertive without signaling disrespect and intense negative emotions to Diasaya and the group.

The participants in this study used a combination of prosody markers to appropriate resources and create structures that help decrease the breaches of encounters across categories of age, ethnicity, gender, and role. Rey, the twins, Diamond, and Amber are considered ethnically different. Rey is significantly older than the students. As age, role, and ethnicity became primary distinctions in this study, what was observed was the creation of interstitial culture to exchange roles and build solidarity across these boundaries. As Roth and Tobin (2007) maintain, culturally different individuals not

separated by space and involved in the same chains of encounter may not be at a disadvantage in recognition of emotion and creating emotional solidarity. In accordance, we must move beyond deficit perspectives, which suggest that education contexts must align with the diversity of individuals and opportunities to create success. These findings support an effort for science educators to become familiar with and find ways to extend the concepts of solidarity and positive emotions as parameters for successful teaching and learning in science education. This idea offers a useful means by which to move us beyond deficit theories of youth towards theories of possibilities that extend across difference and create productive ways of being in their lifeworlds.

Chapter 5

Conclusion

What this Study was About

The study described in this dissertation details the exploration and expansion of new and productive ways to construct understandings of success in the teaching and learning of science in urban classrooms. It highlights the encounters of five research participants in a tenth grade acid-base chemistry laboratory classroom activity in NYHS, a small learning community public secondary school in the Bronx. Throughout the dissertation, a position is constructed that views teaching and learning science as a form of cultural enactment. Central to this view is the attempt to attend to deeper epistemological and ontological issues related to the conditions of social life in urban science classrooms. As such, knowledge of how study participants enact interstitial culture to create success in teaching and learning science is constructed by rendering relationships among individuals, institutions, and other social constructs across dialectically connected micro, meso, macro, and global levels of social life.

The populations of urban centers, such as the Bronx, are increasingly becoming diverse. New and diverse streams of immigrants alongside long-term residents create dynamic modes of differences dialectically connected with modes of sameness. Although past and current attempts to overcome differences are often accompanied by control-over and conformity, similar interests, such as interest in science, create the need and opportunities to build interstitial culture to create successful encounters to meet goals and

motives. Interstitial forms of culture become the bases for the emergence of shared culture and solidarity that can be used for successful encounters across boundaries of difference. Science classrooms are a seabed for these types of opportunities. As exemplified in this study and explored above, Rey and the students find themselves in the same class enacting interstitial culture to learn and teach chemistry together across boundaries of difference.

As mentioned above, the legacy of old and new macro structures such as different streams of immigration, ethnicity, and policy mandates to close the achievement gap in science via high-stakes testing in public schools saturate the social life of the classroom experienced by Rey and his students. Chapter 4 part I analyzes mandates that require students to accumulate 1200 minutes of chemistry laboratory experience in order to qualify for the chemistry Regents coupled with administrative pressures to show high Regents pass rates and maintain NCLB school funding. These policy mandates are macro structures that often serve to structure how students are grouped and counseled. For example, all four students were counseled by Rey, with the support of NYHS administration, not to take the chemistry Regents as scheduled because they were projected to score low on the exam. Enacting these policy mandates often create structures in the school and classroom that prevent students from accessing resources to continue to learn science.

It is significant that participants in this study construct identity associated with social locations across categories of difference, such as ethnicity, class, gender, urban and

high school grade status. For example, in chapter 4 part I the students explain the progression of their camaraderie and affiliation from their freshmen year into the sophomore year at NYHS. It has been evidenced (see chapter 4 part II) that participants enact solidarity around science, science education, across these social categories of difference. For example, the students create rituals, appropriate and exchange roles, and use prosodic markers characterized by chains of encounters embedded in the capital exchange cycle that helped them successfully complete the pH laboratory activity. For any context, be it ethnic neighborhoods, urban center, and science laboratory classroom activity, there exists cycles of social, symbolic and cultural capital that are produced, reproduced, and transformed. These cycles guide encounters and help to create and recreate interstitial culture or new ways of being. For example, as Rey and the students enact social life they engage in their own experiences of *being* in and *belonging* to the classroom. They also enact new ways of becoming more fluent in science that coalesce in the context of their urban and immigrant histories. These histories are produced in narratives mediated by the agency|structure and agency|passivity relationships.

What I learned: Claims in the Dissertation

A productive way to think about issues of control-over in science education is as an attempt to process conformity as a form of cultural enactment. Cultural resources, such as sanctions and expectations, create struggles and resistance in classrooms, decreasing fluency in teaching and learning of science. For example, students who do not meet the expectation of passing Regents exams often find themselves experiencing structures that sanction their desire to be involved in learning more science. These students are often programmed to take less science courses or counseled not to consider

careers in science. Given the general emphasis on control-over in the context of urban schools and high stakes testing, role-to-role encounters are usually framed in a manner that discounts the capital that teachers and students bring to help enact productive ways of teaching and learning science. Deficit lenses emerge and are embedded in socially authorized myths about urban youth. These lenses often down play the crucial role of school structures and trivialize the agency of youth and teachers who experience these structures on a daily basis. Such typical circumstances, make potentially productive and fluent student-student, as well as student-teacher, encounters appear as contradictions and result in them being sites of conflict that create dispositions for social, symbolic, and physical violence. Consequently, new ways of evaluating success in science education must include understanding successful encounters and the creation of interstitial culture across modes of difference. The study presented in this dissertation speaks directly to such a need and contributes by building a framework (see chapter 4, part I) to enact such an understanding and asserting the claims discussed below.

Overarching Claims in the Dissertation

1) In the streams of multi-generational immigration, associated with NYC and the Bronx, modes of solidarity centered on interest in science and science education are created across boundaries of differences.

The historical analysis featured in chapter 2 exemplified the emergence of the Bronx as an urban center in which current residents and youth living in the Bronx garner capital associated with different eras and neighborhoods within the Bronx. In the 1970s, the Bronx was brought to national and international attention as an example of a

quintessential urban center plagued by poverty, blight, and poor public schools in the backdrop of diverse streams of immigration. The more current increase in diversity resulted from long-term residents and diverse cycles of newer immigrants settling in the Bronx. The metalogue in chapters 2 and 3 explored how modes of difference are created in the Bronx through immigration, housing, and other structures, alongside modes of similarity through interest in science and science education. For example, Rey is a middle-aged male chemistry teacher of Filipino decent with an extensive international background in environmental chemistry. While Rey is a first generation immigrant who identifies as middle class, the students in this study are all female of color and second-generation immigrants completing the tenth grade coming from working class families living in the Bronx. Angel and Disaya identify as Caribbean-American. Diamond identifies as having Dominican heritage and Amber identifies as having Puerto Rican heritage. Rey's choices to settle in the Bronx coupled with his background in chemistry and science education eventually led him to obtain a position as a chemistry teacher at NYHS because of the school's focus on science and health sciences. Similarly, the students' and their families' interest in seeking a small learning environment high school in the Bronx that would create opportunities for professional career paths in the health sciences eventually led the students to attend NYHS. Macro education policies that constituted NYHS as a small learning community with an imposed curriculum requirement for all its students to take Regents chemistry and the associated standardized exam created structures that enable Rey and the students to be grouped (mechanical solidarity) in the same chemistry course. Rey and the students enact interstitial culture

characterized by mechanical and emotional solidarity to create success and fluency in teaching and learning of chemistry

2) Solidarity and emotions can be discerned and maintained across a set of successive utterances and gestures that help decrease breaches and increase fluency in the chains of encounters. As such, students regulate learning by creating agency and structures (resources) that help to create positive emotional energy and sustain solidarity.

A key element in creating and sustaining interstitial culture is the enactment of rituals to decrease the breaches and increase fluency in chains of encounters. The enactment of new culture experienced on the micro level of social life takes traction because participants create micro successes that map into different forms of rituals. These rituals (patterned action over time) are experienced on the meso level of social life and are imbued with emotional energy. For example, as Amber enacts chemistry fluently, by creating a forming ritual characterized by counting each set of three drops added to the system of test tubes, she creates a resonant structure for coparticipation and synchrony that is eventually appropriated by Angel. Angel begins counting the number of drops added to the test tubes with Amber. Amber's (and Angel's) counting is timely, appropriate, and anticipatory, and tend to the goal and motives of the group's successful completion of the laboratory activity. The ritual is also associated with the build up of positive emotional energy. Eventually the build up results in an outburst by Amber filled with positive emotions. As such, paying attention to the emotional energy in a classroom

helps to increase successful encounters, maintain synchrony and coparticipation, and minimize negative emotions that can contribute to breaches in the flow of activities.

3) The participants in this study used a combination of prosody markers to appropriate resources and create structures that help decrease the breaches of encounter across categories of age, ethnicity, gender, and role.

Solidarity is part of cultural enactment, consequently it is constantly being produced, reproduced, and transformed in a dynamic manner. This research illustrates how all four students were able to successfully coordinate their encounters by appropriating capital and creating agency and structures along with positive emotional energy that supported solidarity. Emotions are a central part of maintaining solidarity and understanding the student-student and teacher-student classroom encounters. Even when negative emotions surface, if there is enough net positive emotional energy to offset the negative emotional energy, classroom participants are still able to maintain solidarity and attend to goal and motives. This paper also suggests that the display of body gestures coordinated with prosody markers, such as pitch, intensity, and variation in utterances, are major resources for tracking emotional valence and solidarity. Human beings use prosody pragmatically as part of repertoire of nonverbal communication to orient the purpose at hand. Increased pitch level and intensity combined with utterances that signal resistance or challenge correspond to the "heating up" of situations, while a lowering or matching of pitch and intensity are signals of nonverbal repair rituals corresponding to a "cooling down" situation. This study also found that variation and range of pitch,

intensity, and duration of utterances, and the production of power in the air, are used in combination to communicate intense emotions without introducing conflict. Prosody, the content of speech, and body gestures embodied, as rituals are appropriated as resources and define modalities that set the rules of engagement. For example, when Angel advocated a second time for Diamond and Disaya to switch roles, she increased her pitch without increasing the range and screaming (increased intensity). This allowed Angel to be assertive without signaling disrespect and intense negative emotions to Diasaya. The participants in this study used a combination of prosody markers to appropriate resources and create structures that help decrease the breaches of encounters across categories of age, ethnicity, and gender, and role. These findings support an effort for science educators to become familiar with and find ways to extend the concepts of solidarity and positive emotions as parameters for successful teaching and learning in science classrooms.

Implications

It is not productive or sufficient for teachers to focus on control-over issues or be the only one solely responsible for the quality of teaching and learning in the classroom. As such, a vision of shared responsibility for teaching and learning of science must be enacted that is constructed by student and teacher agency in dialectical relationship with the structures they experience. Structural resources must be put in place to create opportunities to build shared culture that sustain solidarity and positive emotional energy across chains of successful encounters and fields while enacting science curriculum. One way in which this can occur is the building of interstitial culture where the creation of successful rituals can become part of new cultural forms that can be

enacted when resonance structures are experienced. For example, if students create interstitial culture to enact successful ways of conducting titrations using burettes in a chemistry laboratory when they encounter new laboratory situations with similar resonance structures, e.g., a titration experiment or burette, they will be able to easily appropriate the structures and enact the new titration successfully. In this way students get to expand their agency, rebuild identity, and capital with repeated successes in science across different fields. In other words, agency afforded by cycles of social, cultural, and symbolic capital and positive emotional energy associated with success and enacting science fluently has the potential to transfer into other field of science education.

Present in the above example is also implications for new ways to access and evaluate teaching and learning science. Education policy makers and curriculum planners must revisit old models of accountability embedded in deficit perspectives, use more productive ways to access, and evaluate teaching and learning of science. Classroom and other fields associated with school can be organized to provide resonance structures that can be appropriated to increase the disposition to teach and learn science successfully. As interstitial culture is created around new experiences, new dimensions of solidarity are created to enact science successfully across categories of difference, such as ethnicity, age, class, and gender. The new form of culture can provide counter narratives to cultural myths that summon deficit perspectives and serve to reorient practice as it simultaneously reorients understanding. For example, students who create successful ways of doing science can build identity and capital to gain respect from teachers and administrators. As such, students can gain a voice to communicate "how

best to teach and work with me." Change in understanding can cause ripple effects that help teachers and administrators structure activities to address students' interests, show respect, and create more opportunities that resonate with forms that are relevant and significant to meeting their goals and motives, e.g., doing well on exams to gain access to the next level of career oriented science programs.

To reorient assessment it is necessary to view teaching and learning as forms of cultural production (reproduction|transformation). As such teaching and learning are empirical endeavors that routinely require interpretations that are emergent. As culture get produced and simultaneously reproduced and transformed, new ways of accessing and evaluating students must come closer to their praxis and practices over time (rituals). As Tobin, Elmesky, and Seiler (2005) note, the learning of science, as culture, extends beyond the concepts and fixing "faulty" algorithms unaligned with exams that students may bring with them to their science classes. In this way, dynamic involvement in a variety of different activity produces new patterns that catalyze higher order assessment and evaluations. For example, students as coteachers or participants in group activities, such as cogenerative dialogues, can serve as kernels or starting points for structuring evaluations that attend to productive ways of developing access and evaluating of praxis and rituals while simultaneously engaging understanding in real time.

Positioning the Research

Utility

The utility of this research effort is realized both in the knowledge it produces and the applicability of the knowledge produced by other users. The knowledge produced in this research has both theoretical and empirical orientations consistent with mechanisms for action and change. This refers to the possibility of the research finding being useful to others who engage in its knowledge products. The analytical shifts and methodological framework constructed patterns of coherence and their associated contradictions across a span of data sets, such as audio video footage and transcripts. The analyses of some of these data sets are present in this dissertation and other associated publications. These spans of data and analyses offer scope and depth in which findings that illuminate relationships in science education across micro, meso, macro, and global levels of social life can be communicated. As such, opportunities are afforded to stakeholders from various positions to identify significant ways to employ new lenses to the knowledge produced in the research. Coupled with the authenticity criteria, this positions this research as authentic and useful.

Authenticity Criteria

As the study unfolded, various ways emerged that met the authenticity criteria. Discussing different ways of being in teaching and learning science as social life unfolds is central to ontological authenticity. For example, during the cogenerative dialogue that occurred immediately after the pH laboratory Angel found out that the other students in the group had been taking a back seat to engaging in the use of the equipment in the lab

class because they felt that Angel was manipulating the time available to use the equipment. When the other group members brought this to Angel's attention, she explained that she likes doing labs and creates ways to have maximum time using the laboratory equipment. When Angel entered the laboratory, she made sure to copy the notes quickly so that she would be the first to use the equipment, while the others often used the first minutes of the laboratory time to socialize. Although a definitive way for the other group members to trade roles and access the equipment was not cogenerated, it created a kernel for the group to consider enacting roles that are more equitable to achieve their goals and motives in the laboratory. As immediate stakeholders reviewed video footage and talked about forms of coparticipation associated with their involvement in science and the study, opportunities were created to negotiate and co-construct recommendations to enhance the research.

These recommendations also produced ripple effects that took shape across other fields. For example, sending for the critique of parents and students abbreviated write-ups and the completed version of an article from the study not only created additional opportunities for the university researchers to interact with parents but also created opportunities for the students and their parents to share career goals and achievement in a manner that extended beyond performance on high stakes examination. It also provided ways for the parents, students, and researchers to share ideas to catalyze change. For example, after talking with Angel and Disaya's mother, I learned that she was opposed to the school suggesting that students purposely not take chemistry Regents exams when they were scheduled to sit for the exam. She informed me that she had called NYHS to

protest, but the school administrators still insisted that Angel and Disaya wait a semester to get additional practice before taking the Regents chemistry. This led Chris Emdin and me to meet with the principal and Rey to suggest that the school reconsider this policy and the role that Regents was playing in meeting the needs of the students. At the same time, I became associated with a university-NYC Department of Education initiative to create foundation science and math courses for senior high schools students interested careers in science. This initiative targeted high schools in the Bronx. The courses were meant to prepare students for freshmen level college coursework without focusing on standardized exams such as the Regents or advanced placement courses. This became an ideal opportunity to act tactically to catalyze change for senior level students at NYHS.

At that time, NYHS was looking for science programming for their first senior class. The principal and the science staff had come to a decision to move away from an overemphasis on standardized exams for students in the twelfth grade and emphasize preparation for freshmen level college courses. The university initiative was looking for schools in the Bronx that would have an easy time programming the new foundation course in the senior year. The course included community health projects, writing for the sciences, and conducting environmental research in the Bronx. Since NYHS did not have a set senior program, it was an ideal opportunity to meet the school and the students' needs while creating a needed partnership with the local university. During the initial planning phase, Chris Emdin and I acted tactically to access key university and NYHS administrators to generate a plan and a vision to bring the initiative to NYHS.

Other opportunities to catalyze new career goals occurred with Rey and the students. The students expressed a need for resources to learn about career opportunities in health science. In talking with the students, they confided that they only knew of popular brand name schools that seemed financially outside their reach. Visits to several programs and key contact in the City University of New York (CUNY) and State University New York systems were suggested, particularly to physician assistant programs and other health science programs. As a result, the students decided to ask for additional trips to health science college programs as part of their senior year experience. Similarly, Rey became interested in pursuing a doctorate in urban education and gained admission to the Urban Education Program at CUNY. As Rey became a central participant in the research effort at NYHS, he began to participate in more research meetings and became interested in becoming a university based science educator. Rey also began writing a very compelling science autobiography.

As this research became part of my science autobiography, it allowed me to build my identity as a scholar and a university science educator. Building and rebuilding these identities both constrain and open new realms of possibilities that are imbued with emotional energy. Consistent with the myriad ways that account for complexity, persistency of worldview, orientation, and disposition, I selected to engage in practices and schema that created narratives in possibilities, experiences, and positive social change in science and science education. That is, there is a dialectical relationship between the community and myself that is inherent in the unfolding of social life. I

develop myself as a science education researcher, within a community of practice, to build depth, scope, and fluency within this research.

Limitations

There are limitations that are present in the research described in this dissertation. While limitations are inherent to all research, they provide grounding that pointed away from omnipotence. The theoretical lens constructed in this study does not claim to explain all of social life associated with teaching and learning of science. As one theoretical lens is used to illuminate phenomena other phenomena become simultaneously obscure. As such developing a coordinated set of theoretical lenses that guide the deployment of methods provides strategies that can bind interpretation and unravel it. As such, a key limitation of this study was the lack of opportunity to engage the student participants in more substantial theoretical underpinnings used in this study. The students brought tremendous insights that help others interpret social life in a science classroom. However, after the university researchers wrote the interpretations, it became evident that resources need to be put in place for students, parents, and teachers to access and comment on the written analyses. Although shorter and more accessible versions were made available, a reduction of analysis usually resulted. A second limitation involved cultivating encounters with parents as central and ongoing participants in the research. Parents are valuable and important stakeholders in this research. The effort and time to get parents involved should be front loaded to get them involved early on in the research. In this research, parents were engaged after reports were written. It was quite apparent after discussing the report with them that their unique lenses should have been captured early on. Finally, the students' plans to conduct ethnography beyond the

school in other parts of their lifeworlds had to be halted because it interfered with their academic performances in school. This opportunity was important to gathering additional data to support claims about culture being enacted across fields.

Future Research

Looking ahead to the priorities for conducting future research draws attention to the importance of investigating how interstitial culture creates success in teaching and learning of science and is enacted across fields. Follow-up studies by the NYC research squad are being conducted at NYHS to investigate how students and teachers act agentically to create opportunities to meet their personal goal and collective motives. A greater opportunity now exists at NYHS to create a trajectory for more students, as well as teachers, researchers, parents, and administrators, to become more fluent in science and science education.

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