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Becoming an Urban Physics and Math Teacher

Infinite Potential

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BECOMING AN URBAN PHYSICS AND MATH TEACHER

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Infinite Potential

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Foreword

In the United States it certainly is the case that we live in a country that adheres to an ideology of individualism. In education this ideology is manifest in holding teachers accountable for the achievement of their students, and teacher educators accountable for the quality of teaching. Similarly, in school districts such as Philadelphia, where this research was undertaken, school principals are held accountable for the quality of the educational programs in their schools. In making this claim about individualism I do not seek to oversimplify an argument that individualism is the only referent used in formulating and enacting policies. Clearly there is recognition of complexity and the mediating effects of others' actions on individuals accomplishing their goals. However, in arguments over accountability it always seemed beyond argument, for example, that teachers should have control over their students and if that were not the case then the teacher is not effective. Similarly, as a teacher educator, there is a widespread perspective that I should train teachers to establish and maintain tight control over students, and plan and enact curricula to meet mandated national, state, and local standards in ways that align with testing programs such as those associated with the *No Child Left Behind* legislation. Failure to comply with these expectations, while possible, feels risky. The ideology of individualism is taken for granted, part of normal social life, not usually a focus for discussion or a point of departure. Indeed, arguments that depart from an emphasis on individual accomplishment, exercising control over students, and departing from the alignment of curricula with mandated goals and statewide testing are regarded as lowering standards and unscholarly—examples of Liberal thinking that belonged in the 1960s and have no place in the modern era.

Teacher educators face numerous pressures, not the least of which is that almost anyone you speak to is an expert on teaching and how to train teachers. From janitors to deans, opinions on what constitutes good teaching are presented willingly and with conviction—after all we all had teachers and our experiences are reified in stories that incorporate what we believe about teaching and learning.

The problem of having so many experts is compounded by a profound disrespect for research on teacher education and learning to teach. There is a widespread assumption that there is little research out there to support what is done in teacher education and what little there is carries a weight that is no more substantial in many instances than stories told by the local school principal and much less important than the convictions of a dean of education. As if these problems are not enough for teacher educators to endure, there also is the intervention of politicians who have mandated that what counts as research, and therefore is compliant with *No Child Left Behind*, is scientifically based studies. Hence, there is a press to disqualify research findings that do not emanate from scientific studies. Advocates for such approaches to education research include scientists with little understanding of education theory and practice and educators with little understanding of the sciences. This is not the place to deconstruct this political move—suffice to say, it is a major source of irritation to many educators, especially those who undertake research that is built upon sociocultural foundations that do not embrace oversimplified models derived from the physical sciences.

Within the teacher education community is widespread acceptance of models of learning to teach that embrace reflective practice and learning from field experiences in which university-based and school-based educators meet with new teachers to discuss the new teacher's performance during field experiences. Many of these models acknowledge the centrality of mentoring and building teaching competence around the expertise of mentors, what is done in the field, and current research and theory. Such an approach was a point of departure for our venture into coteaching and cogenerative dialogues, setting the stage for the research undertaken by Beth and Ian in this volume.

We were frustrated by the challenge of finding suitably qualified mentor teachers in urban public schools in Philadelphia. The city was large and getting to schools that were geographically dispersed was a challenge. Furthermore, the high schools closest to the university in which I was Director of Teacher Education were among the lowest performing in a low-achieving school district. Many faculty in the university felt a responsibility to make a positive difference to the education of high school youth in area high schools. Accordingly we opted to assign large numbers of new teachers to City High with the goal of creating a community of practice at the school—a community that valued inquiry into learning to teach and was committed to raising the educational opportunities for urban youth, most of whom were from home circumstances of high poverty and differed socially and culturally from the new teachers.

An unexpected problem we encountered was that several of the resident teachers at City High were unwilling to give up their classes because they were not confident that the new teachers could control their students. Many of these resident teachers were struggling to control the students and promised to make their classes available when the classes were more settled. The mentor teachers' lack of confidence was reinforced somewhat by experiences throughout the school where many resident and new teachers struggled to control students. After almost a semester, the frustrations of the new teachers who were unable to teach mounted to the point that a summit meeting was called, to include me, the new teachers, the resident teachers who would not relinquish their classes, and the school principal. The outcome of the meeting was not what I expected or hoped for. Rather than give up their classes, the resident teachers opted to withdraw from their agreement to be mentors for the new teachers.

The school principal was known as innovative and focused on getting the best for his students. "Why don't we create some special classes to be taught by two new teachers?" His request seemed risky to me, but he was enthused and, since all of the new teachers already had an undergraduate degree in science, he could arrange emergency certification for them to teach the class without a mentor being present. With some reluctance I agreed to the idea, with the provision that we undertake research on what happens. The bold plan put forth by the principal catalyzed a program of research that is ongoing and an approach to teacher education that incorporates coteaching and cogenerative dialogue.

Central to coteaching is learning to teach by *teaching* with *another*. What is learned can be through conscious intent or it can be unconscious. Hence it is important for coteachers to analyze their teaching to ascertain what happens, figure out why that happens, and identify contradictions—especially those that produce undesirable outcomes. Cogenerative dialogues, which are critical dialogues among participants from the cotaught class, are ideal fields for identifying what works and what does not. For example, a typical cogenerative dialogue would include the coteachers and two to three students from the class, with the purpose of improving the quality of teaching and learning and, in so doing, create collective recommendations for change and responsibilities for enacting them. Cogenerative dialogues developed from a project in which each class in which we placed new teachers would identify two students, selected for their differences from one another, to act as coaches on how to "better teach kids like me." In collaboration with Wolff-Michael Roth we developed cogenerative dialogues as fields in which changes in the roles of teachers and students could be negotiated, classroom rules could be changed, and resource accessibility and utilization could be modified.

Beth and Ian describe longitudinal research of critical importance—studies of learning to teach through coteaching and cogenerative dialogue during a teacher certification program and subsequent investigations of Ian's role as a curriculum developer in a summer program and his initial two years of teaching. Accordingly, the research explores crucial questions that teacher educators need answers to, especially those who employ coteaching and cogenerative dialogues. For example, can a new teacher who has employed coteaching in his initial teacher education program teach solo? Is there evidence of transfer of teaching strategies from coteaching to solo teaching? Can cogenerative dialogues be adapted to improve the quality of teaching and learning in classes with only one teacher? Questions such as these are central to this book and as such are essential reading for stakeholders in teacher education.

The research is a fine example of research in education that is theoretically rich, incorporating an array of methods that explore questions to which teacher educators, school-based personnel, and policymakers should attend. The collaboration between a teacher and a university researcher is an example of the added value that comes from coresearching challenging contexts such as those experienced in inner city schools, especially when differences between the teachers and students include race, ethnicity, and social class. Furthermore, the involvement of students through cogenerative dialogues in curriculum development and research has enormous potential and serves as a reminder of the folly of continued adherence to an ideology of individualism that de-emphasizes the centrality of building communities with students as active participants, enacting an expanded array of roles. The theoretical and empirical support for a dialectic relationship between the individual and collective is just one of a plethora of reasons for the salience of this research, not just for the United States, but also for a global community in which policy mandates diffuse rapidly and approaches to teaching, curriculum, and accountability have a depressing similarity in a pervasive climate that supports a rationale for aligning national standards, enacted curricula, and testing. Preparing teachers to thrive in such environments is a priority and little attention is given to scholarly essentials that include deliberating answers to questions such as: what is teaching; what are the best ways to learn to teach; and how can learning environments conducive to student learning be created and maintained? The research in this book addresses such questions and raises issues that should command the attention of educators in the global community.

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Preface

The beginning: In Beth's words

This book chronicles almost three years of research in and around Ian Stith's physics and math classrooms. Although the impetus for the research emerged from my doctoral studies, by the final year of data collection, Ian and I worked together in collaboration. I first met Ian during the spring of 2003, prior to our work together on a curriculum project that also included a group of students from an inner city high school in Philadelphia. Ian was finishing up his Master's degree in education, while I was beginning my dissertation. Around that time, I became interested in studying the transition between preservice teachers' student teaching experience and their first year of in-service teaching in urban schools. My interest was spawned by the daunting teacher turnover statistics in the city of Philadelphia, which indicated that only 52 percent of new teachers who began during the 1999–2000 school year were still teaching in the district three years later (Neild & Spiridakis, 2003). In addition, I was highly interested in exploring the experiences of White teachers who work with predominantly African American students and how socioeconomic, social, racial, and cultural differences might impact interactions, teacher–student relationships, and student learning.

At that time, Ian was finishing his student teaching and trying to find a position as a physics and math teacher in Philadelphia. He had completed his graduate-level teacher training at a large university in the Northeast immediately after receiving his Bachelor's degree in mechanical engineering. Ian's teacher education program was unique in that he had spent a large portion of his year-long student teaching experience coteaching with another student teacher (Roth & Tobin, 2002, 2005). As my understanding of coteaching expanded, I grew increasingly interested in the futures of those who had primarily taught with others during their preservice experiences. How would these individuals fare in the reality of a traditional, autonomous setting as first year teachers?

As I was beginning my dissertation, my adviser, Ken Tobin, suggested that Ian would be an excellent person to consider for my study. By examining Ian's case, I would be able to focus on the experiences of a beginning teacher in an urban school district. Furthermore, Ian, a White, middle-class male from the suburbs, was quite different from his students, who were primarily African American and from working class families or conditions of poverty. Ken had worked closely with Ian during his student teaching experience and claimed that Ian and his partner Jack had been quite successful in coteaching an engineering physics class at City High School, a large, neighborhood secondary school. Incidentally, Siobhan McVay, one of Ken's other graduate students, had collected a significant amount of video footage of Ian and Jack coteaching over the previous five months. Thus, I would also be able to trace Ian's transition from coteaching with Jack to his traditional, autonomous experiences as a first year teacher. In essence, Ian was an ideal subject for an in-depth, qualitative case study, considering my research interests.

That summer, Ian and I worked together with four students to develop a set of science units. We detail our work, which was incredibly illuminating for us both, in chapter three. During that time, I began to develop my research questions. Rather than doing this in isolation, Ian and I were in constant dialogue about our interests and ideas. In line with what other individuals who knew Ian had mentioned, I learned that Ian was extremely laid-back, yet thoughtful about the potential for our work together. These early conversations laid the groundwork for a collaboration that would span the course of several years and would foster a longitudinal study.

Emerging and evolving questions

Although Ian and I discussed the research that would occur in his classroom, the first phase of data collection and analysis was conducted primarily by me. In the beginning, Ian was experiencing the chaos of beginning a job, which left him barely enough time to participate in my countless interviews, debriefing sessions, and other attempts to gather data. Additionally, this portion of the study resulted in my dissertation, so naturally the data collection, analysis, and writing was my responsibility. Ultimately, my research questions focused on his agency, or his power to act as a beginning teacher. Specifically, I considered: (1) What are the structural changes that Ian encounters as he transitions through various fields (i.e., student teaching at City High and his first year of teaching at Leach Learning Academy)? (2) How does Ian use agency to find success as a new teacher?

After I completed my dissertation (at the end of Ian's first year) and decided to publish it in the form of a book, Ian and I began discussing his involvement. We decided that a longitudinal study that spawned Ian's student teaching and his first *two* years of teaching would better show the development of his practices, and would enable us to expand more on some of the ideas that emerged initially in my dissertation. Over time, as we came to new understandings and subsequent questions emerged, we refined our questions. As a result, two sets of questions guide our research and the analysis in the chapters that follow.

1. What are the structural changes that Ian encounters as he transitions through various fields, and how do these changes affect his agency? Do his teaching practices traverse fields?
2. How did Ian build relationships with students across cultural, racial, gender, and socioeconomic boundaries? How did these relationships affect teaching and learning in his classroom?

In an effort to further elucidate the intricacies of these broad questions, we considered narrower questions to guide our inquiry of each of the varied fields through which Ian transitioned as a new teacher. Thus, the following subset of questions were also salient.

1. How did Ian's involvement in coteaching shape his teaching practices?
2. What did Ian and the other student and teacher researchers learn during their collective participation in a science curriculum development process?
3. How did Ian build bridges with the student researchers in the summer curriculum project?
4. What structural changes does Ian encounter at Leach Learning Academy?
5. How did Ian build and use capital with students?
6. How did Ian change the structure of the traditional math class?
7. What structural changes does Ian find upon his return to City High School? How do these shape his practices?

Through the synthesis of our observations, analysis, and narratives, we present the results of our work together, which connects themes such as transitions for beginning teachers, the implications of coteaching, teacher identity, student voice, classroom decision-making with students, science-based mathematics, and making connections with students across borders. In the chapters that follow, Ian and I touch upon each of these themes in a way that weaves together his voice, my voice, and the voices of Ian's students.

Methodological considerations

Within several chapters of this book, we briefly describe the means by which we carried out the data collection and analysis. However, in this section, we provide some insights on our methodological framework. Initially, in considering the methods that would be used in the study, it became very important to solidify our own beliefs about the nature of qualitative research and their connections to an established research paradigm. By and large we identified with the elements of constructivism, which assumes a relativist ontology and a transactional or subjectivist epistemology. However, because of critical and transformative nature of our work in urban schools, several aspects of critical theory are also important for our study (Denzin & Lincoln, 2000). In essence, the issues, beliefs, and understandings incorporated within these two paradigms became an important way for me, and later, for Ian and I, to continually consider the underpinnings of our methodological framework.

Essentially, we describe our research as critical ethnography. Critical ethnography seeks to address the limitations caused by individuals' economic, social, and historic situations. The essence of critical ethnography is illusive; definitions of the methodological concept and the ways in which it is carried out are generally inconsistent. The element of coherence within critical ethnography is not in its methodology, but rather in the value orientation of those who draw upon it to guide their research. Critical ethnographers frame their research in the assumption that "contemporary societies have systemic inequalities complexly maintained and reproduced by culture" (Carspecken, 2001, p. 4). Hence, by using a critical lens within our ethnographic research, we sought to unpack the social structures and pay particular attention that those that could impede equality.

A constructivist grounded theory approach (Charmaz, 2005) informs the analysis. This approach stresses the alignment between the goals of social justice research, the connectedness between structure and agency, and the emergent data analysis.

> Grounded theory entails developing increasingly abstract ideas about research participants' meanings, actions. And worlds and seeking specific data to fill out, refine, and check the emerging conceptual categories. Our work results in an analytic interpretation of participants' world and of the processes constituting how these worlds are constructed. Thus, we can use the processual emphasis in grounded theory to analyze relationships between human agency and social structure that pose theoretical and practical concerns in social justice studies. (Charmaz, 2005, p. 508)

Because a dialectical and dialogical methodology was appropriate for the study, and the theoretical framework focused on the dialectal relationship between structure and agency (Sewell, 1992), Ian and I planned to incorporate various voices into the research. To do this, Ian was much more involved in the data collection and analysis than traditional research participants. During his student teaching and first year of autonomous teaching, Ian's participation was contingent upon his availability and time. However, during the third year of the study, he took responsibility for collecting data, analyzing it, and writing up the results. Because of a National Science Foundation grant, we were also able to hire student researchers from Ian's class who helped add to and analyze the data. My objective was to serve as the "passionate participant" or as one who "actively engaged in facilitating the "multivoice" reconstruction of his or her own construction as well as those of all other participants" (Denzin & Lincoln, 1994, p. 115). We envisioned that the collaborative nature of the study would aid in this endeavor.

In the chapters that follow, we describe the locations where we collected data and the participants for each specific context. We also provide more detail on our data collection and analysis. Throughout the study, multiple data sources were collected and utilized in an effort to provide the most complete ethnographic description possible of Ian's experience. The sources included video footage and field notes, formal and informal interviews, cogenerative dialogues, written narratives, journal entries, documents, and artifacts. Each of the sources informed at least one of our initial research questions; in many instances the sources addressed multiple questions.

Approaching this book

This book may be read in two ways. Some may choose to read the chapters in order, so as to get a sense of Ian's experiences as they actually happened in real time. When read chronologically, the chapters portray three years of Ian's growth as a teacher. Others may be interested in learning more about a specific segment of Ian's development, for instance, the coteaching experience or his interaction with urban youth in constructing physics curriculum, and may want to move directly to that specific chapter. Throughout the book, we use pseudonyms to refer to all teachers, administrators, students, schools, neighborhoods, researchers, and other individuals that we mention in order to protect their identities.

The distinction in voices is a significant aspect of this book. Often throughout the chapters, we use the first person plural ("we") to convey the collaborative

nature of our analysis and interpretations. At other points, we preserve the individuality of our perspectives, thoughts, and ideas by identifying the writer. We do this either in the subtitles, for instance, as we did in this introduction by indicating Beth's voice. Other times, we personalize the voice within a section by indenting and prefacing the narrative with one of our names and a colon.

At other points in the text, we use metalogue, a type of written dialogue, to accomplish two different objectives. First, it allows both of us to preserve our own unique voices and elucidate our own constructions of observed phenomena (Roth & Tobin, 2002). Second, it better reflects the dialogic, reflexive nature of the subject matter (Roth, McRobbie & Lucas, 1998). Overall, as we consider the reflexivity of our theoretical framework (the duality of structure and agency) and the importance of voice in our research, it behooves us to present our work in a similar vane. It is our intent that the metalogue will show readers the dialogic nature of our viewpoints, highlight contradictions, and forge shared understandings about the issues throughout the text.

Transcription conventions

Throughout the text, we use the following transcription conventions.

* – Denotes the moment in the transcript that correspond to the video offprints [figure], which we put in series to provide the data set of changing action. Each figure constitutes independent data that cannot be substituted by written description.
((*Leanne grabs the board…*)) – Salient and relevant actions are noted and are enclosed in double parentheses and in italics.
[– Square brackets in consecutive lines indicate beginning of overlapping speech or action.
(?) – Question mark in parenthesis indicates inaudible utterance(s).
so- – Hyphen at the end of word marks sudden stop of talk.
(sure?) – Indicates uncertain hearing of the utterance "sure."
↑no – The arrow indicates a rise in intonation sharper and more clearly noticeable than normally occur.
(note) – Single parentheses contain notes to give more specific information.

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1 Ian's story

Beth's first impressions

Beth: When I entered Ian Stith's mathematics classroom a few minutes ago, I knew that he had something interesting planned because of the ten-foot ladder that is propped up against one wall. At the top end, a small window created out of paper is taped to the wall. Within the panes of the window, Ian has drawn large, intense red, and orange flames to depict a fire on the other side of the window. Ian, whose first period class I've been visiting for the last month and a half, greets the students as they enter the room. Many of them quietly saunter into the room with sleepy eyes since it is barely eight o'clock in the morning. Only a few students appear to be awake. Anton, however, explodes into the room and starts talking animatedly to another student about the Eagles football game that was televised the night before. After most student trickle in and the bell rings, Ian quietly goes to the back corner, opens a bag and puts on an oversized, heavy coat and a firefighter's hat. When he walks into the middle of the room with his costume on, the students immediately stop talking and start laughing. One student says, "Stith—you too skinny to be a fireman!" The students' giggles are infectious. Once they calm down a bit, Ian begins the lesson by telling them that firefighting was a tradition in his family since both his father and his grandfather had been firefighters. He can hardly keep a straight face as he tells them what I later found out was a white lie. After the background story, Ian steps up on the ladder and asks the students: "If we only knew the angle the ladder made with the floor and the length of the ladder, could we figure out how high up the ladder I move (and points up vertically) with each step I take without measuring the height of the window?" Ian then demonstrates how the answer relies on the use of the trigonometric function sine, which he shows them is defined by the angle the ladder makes with the floor. He climbs up a few rungs and discusses what the calculation would be. He then measures the ladder to find the correct value. After completing his demonstration and

> making sure that his students have the tools to figure out the problem, Ian walks around and helps the students, who are working together in groups of three or four. (Beth, field notes, 11/12/03)

Creative, interactive lessons, like the one described above, were representative of Ian Stith's mathematics classroom. Although demonstrations are typically used in science instruction, Ian often sought to blur the boundaries between mathematics and science in his classroom. In this book, we discuss Ian's efforts to unite math and science and his commitment to building relationships with students. Both are significant examples of his agency, or his ability to access and appropriate resources (Sewell, 1992), as a beginning urban educator. Throughout this volume, we chronicle his efforts to create innovative science and math classrooms while navigating the social and institutional structures of an inner city school district. At a time when the media and educational research tends to focus on the problematic structural and organizational issues in urban high schools, Ian's story shows the potential for beginning urban teachers and their students despite overwhelming challenges.

Unfortunately, the dominant discourse surrounding teaching and learning in urban high schools often focuses on the negative. We have had countless conversations with people—our families, friends, and colleagues in education—about the stereotypes that persist surrounding teachers and students in urban schools. Many times, educational research reiterates this negativity. Teacher turnover in urban schools is high, especially among beginning teachers (Ingersoll & Smith, 2003; Neild et al., 2003), urban students lag behind their suburban counterparts academically (College Board, 1999; Ferguson, 2002) and urban schools lack resources (Barton, 2001).

Although we agree that there are many shared issues among urban schools and the challenges teachers face in urban districts are quite distinct from those of schools in rural or suburban settings, negative conceptions of urban schools and students are tough to dispel. Stereotypes or negative descriptions of urban schools are particularly problematic preservice and novice teachers. Due to a shortage of science teachers in the United States and many parts of the world (Woodward, 2001; Wang, 2004), new science teachers often have their pick of positions, which means urban schools may ultimately fail to attract qualified new educators.

We believe that it is important to move beyond the statistics and individual anecdotes that perpetuate negative perceptions of urban schools. In an effort to enrich the findings produced by quantitative research and to demystify the urban teaching experience, substantive, ethnographic descriptions of what urban

science and math teacher face, especially in their first few years in the field, are warranted. Such accounts must illustrate the journeys that new, qualified teachers embark on as they begin their careers in inner city schools. Although ethnographies situated in urban schools have the potential to provide pervasive windows into school cultures, few studies document and critically analyze the cases of successful urban science teachers—especially those just beginning their careers.

This book is the story of Ian's journey, as he becomes an urban physics and mathematics teacher in Philadelphia, a large city in the Northeastern United States. His case is important not only as a means to enrich the literature on new teacher induction, but it also offers three significant elements. First, it depicts a teacher's ability to connect with students that are much different from him insofar as race and socioeconomic status. Throughout the book, we discuss ways in which Ian built relationships and made connections with students across the borders that typically serve to divide students and teachers across elements of race, socioeconomic status, age, and gender.

Second, we provide rich description and extensive analysis of Ian's participation in coteaching (Roth & Tobin, 2002, 2005) as a preservice teacher. During his student teaching, Ian cotaught a physics class with another student teacher. In an effort to expand the coteaching literature, we explore Ian's transition from coteaching to autonomous teaching. Specifically, we highlight the implications of his experience for the field of science teacher education and general teacher preparation. In considering the efficacy of the coteaching model in preparing urban teachers, we must explore teachers' experiences as they move on to teach independently.

Third, this book provides a long-term, three-year ethnography of a beginning teacher's journey between different dynamic, evolving urban school contexts. Throughout Ian's development, he experiences different schools, classrooms and experiences that shape his practices and his teacher identity. As a central theme through the book, we describe the dynamic nature of urban schools and the changes Ian encounters between different schools within the same district. This is particularly important as we examine the structures that shape a teacher's individual agency. We use the dialectical relationship between structure and agency as a lens through which we analyze Ian's progress and development throughout the chapters. Although all of Ian's teaching takes place in the same large, urban school district, we describe the differences between schools and the striking changes in one school over a three-year period. As Ian moves from his student teaching placement at City High School to his position as a first year teacher at Leach Learning Academy, and then back to City High

for his second year of teaching, we investigate these evolving contexts and their respective structures.

In this chapter, we first discuss some of the larger issues that initially inspired this study. We begin by presenting some of the macrolevel structural issues that surround urban teaching such as challenges in high schools, poverty, and social reproduction. Additionally, we discuss the challenges some urban teachers face in connecting with students across social and cultural differences. Later in the chapter, we begin to focus on Ian's story. As a preface to his teaching experience, we provide detailed biographical information about his background and commitment to urban teaching. We show that in some ways he is a unique teacher, yet he faces the same challenges experienced by others who teach in inner city schools.

Later in this chapter, we provide an overview of the theoretical framework that underpins our work. Rather than talking about Ian in terms of success or failure, we discuss his agency, or his ability to access and appropriate resources to meet his goals. The construct of *agency* and its relationship with *structures* are unpacked as we describe the theoretical framework that shapes the study (Sewell, 1992). In addition, we describe the importance of *fields* (Bourdieu, 1984) as sites for cultural production where symbolic, social, and cultural capital (Bourdieu, 1987) is exchanged.

The big picture: The context of urban schools

In the sections that follow we describe some of the foundational aspects of urban schools that shaped Ian's experiences as a beginning science teacher. We contend that new urban teachers need to have a firm understanding of the structural issues that have socially and historically affected urban schools. A comprehensive theoretical understanding of these issues must be supported by rich, practical experiences in the field in which beginning teachers have opportunities to work with students in meaningful, yet critical ways.

To present a realistic sense of Ian's trajectory as a beginning teacher, we first explore the theoretical bases for three interrelated social phenomena, each of which Ian had an opportunity to explore on both a theoretical and practical level during his preservice teacher education. Additionally, each was a recurring force during his first few years of teaching, regardless of the school in which he worked. First, we discuss social reproduction, a cyclical trend that results in low-quality educational experiences for many urban students. Second, we describe the social and cultural differences that often exist between teacher and student populations in urban districts in the United States since the former is predominantly

White and middle class and the latter is ethnically diverse and from lower socioeconomic conditions. This was a significant factor for Ian since the majority of his students was African American and came from conditions of poverty. Third, we provide an overview of literature that suggests the need to examine African American students' school experiences and to make instruction culturally relevant.

Trends among urban schools in the United States

Even though many researchers, policymakers, and practitioners in urban schools work with the specific intention of effecting change, powerful social forces continue to deter student achievement. Urban, poverty-ridden youth now number seven million in the United States and are overrepresented by children of color (Haberman, 2003). Unfortunately, many of these children suffer in the cycle of inequality that is perpetuated within the schools they attend.

De facto racial segregation in schools persists in most areas of the United States, especially in urban areas (Kozol, 1991; Ladson-Billings, 1994). This factor, along with the extreme poverty that characterizes many inner cities in the United States, is apparent in many schools within the School District of Philadelphia, the district in which Ian worked. The student population within the district is 66 percent African American, yet at City High, the large, comprehensive public high school where Ian began teaching, 99 percent of students are African American. Many other neighborhood high schools follow this trend; large concentrations of African American students often attend the largest, lowest-performing schools in the district.

The School District of Philadelphia generally underperforms academically in comparison with its suburban peers. According to *The Philadelphia Inquirer's 2003 School Report Card*, an annual feature in the city's newspaper that documents the successes and failures of all of the schools in the area, seventeen Philadelphia District high schools occupy the bottom slots in both average verbal and math student achievement test (SAT) scores for the Southeastern region of Pennsylvania. Unfortunately, the statistics show that only the competitive and academically selective magnet schools are found in the top slots for academic achievement as per their average SAT scores. Many of the comprehensive neighborhood high schools in Philadelphia like City High, which are overwhelmingly comprised of low-income minority students, are absent from the top of the achievement list (*The Philadelphia Inquirer* Online, 2003).

Student academic performance can be attributed to multiple factors. However, Barton (2001) delineates several major challenges for urban schools, all of which have strong implications for student access to educational equality at

large and science education in particular. She discusses several important issues that are typical in urban schools: less than stellar academic achievement, a lack of resources, specific schooling practices, such as tracking, and the culture of schooling, which often pits the students' home culture against that of the school. Each of these issues has strong implications individually, however, collectively, they work together to impede students' access to high-quality science education. The complex issues that emerge as a result of poverty in urban areas augment each of these structural impediments. For Ian, each of these challenges impacted his work on a daily basis.

> Ian: When I think about the challenges the majority of my students faced on a daily basis I feel almost ashamed to ask them to do homework. The culture of poverty and limited options are so invasive that I cannot question any parent's true intentions or a student's anger with school. The time of day that these challenges are most obvious is in the morning just as school starts. There are countless reasons why a student may be late, or not arrive, for school. It is so much more than faking sickness or a flat tire, it is a student who must make breakfast for the family and walk all their siblings to school. Or it is a parent who barely sees the family because of work. In today's economy, I wondered, is it even possible to move up from the lowest rung in a depressed neighborhood? As a teacher with a steady job, I had enough trouble living in the city, paying bills, and getting ahead without any children, so I cannot even pretend to relate to the challenges faced by my students and their families. But what I can see is how easy it is to become frustrated with the "American Dream" and the concept that hard work will pay off in the end. In the end I really don't know how to feel or what to expect, I just do the best for the students and try to afford them the possibility to truly become lifelong learners.

Implications of poverty, social reproduction, and fear

Many students who attend the lowest performing schools in the School District, like City High, live in poverty. As of 2001, 78 percent of students within the School District of Philadelphia were from low-income households, many of which are headed by grandparents on fixed incomes (Farmbry, 2001). Social reproduction, a force that acts as a stabilizing agent to keep low-income students in their socioeconomic place, continues to override social and educational reforms. According to theories of social reproduction, social inequality is transmitted among generations of students, which renders the notion of meritocracy as an impractical aspiration (MacLeod, 1987). Thus, educational opportunity is not equally attainable by all members of society (Bourdieu & Passerson, 1990; Kozol, 1991; Bowles & Gintis, 2002).

Social reproduction cuts across both socioeconomic and racial lines and manifests itself in urban schools: "City High School [an inner-city, neighborhood high school] in Philadelphia is among those schools that have failed to educate their African American students resulting in reproduction of their marginalized position in society" (Seiler, 2001, p. 3). Elmesky (2001) elaborates on the stratification fostered by urban schools:

> While many African American students possess real hopes that their lives can improve through schooling, in reality, there exists a vicious cycle in which the current urban minority socioeconomic standard of living is reinforced by and simultaneously reinforces the urban, African American experience in the educational system. (p. 8)

Wilson (1987) describes the issue as one in which students who live in poverty do not interact with people who have steady jobs and are subjected to a "social isolation that excludes them from the job network system" that is experienced by others. Students do not associate school with post-school employment and fail to attain the skills and knowledge necessary to be competitors for quality jobs. Thus, joblessness becomes a way of life, which is further perpetuated by teachers who refuse to teach students who will not learn. Described as "communities of the underclass," those who live in extreme poverty are "plagued by massive joblessness, flagrant and open lawlessness, and low-achieving schools, [which] therefore tend to be avoided by outsiders" (Wilson, 1987, p. 58). If outsiders would be compelled to avoid high-poverty, inner city communities, why would teachers choose to work in them? Wilson sheds light on the potential fear or anxiety many might feel in teaching in high-poverty neighborhoods, especially if they are outsiders. Unfortunately, such fear often keeps quality science teachers away from the most needy schools, which ultimately promotes the cycle of social reproduction.

> Ian: The first day I went to observe a class at City High School I was nervous. I wasn't nervous about being safe, but rather whether my students would respect me and how I would react to pressure. It also did not help that my role was poorly defined and the whole situation was foreign to me. Actually, I was interested to simply observe what went on in high schools. It is so strange how a building can be seen from so many different perspectives all at the same time. But it was true that I was not from the city and I knew little about the students' culture, so I was nervous that I would not be able to bridge this gap. But the more I went to classrooms, the more obvious it was that they were just kids and that a positive attitude can go a long way. On the other hand I think some student teachers were scared and felt totally out of place. Also I think some people

> might have been scared for me, such as my mom. She never really expressed this but I think there was some fear there, not so much for my physical safety but more of the unknown situation I was venturing into.

Limited resources

Inequities in funding and resources are the norm among public school systems in the United States. Teaching resources are also lacking in poorer areas and disparate fund allocation leads to the most experienced and highest credentialed teachers being funneled into wealthier schools (Wilson, 1997). There is also a correlation between schools in the School District of Philadelphia with large minority student populations and teachers that have fewer credentials:

> [T]he percentage of certified teachers at a school declines as the percentage of minority students increases. In 2002–2003, 96 percent of the teachers were certified at schools with less than 50 percent minority enrollment, compared to 86 percent at schools with at least 90 percent minority students. (Neild et al., 2003, p. 5)

The absence of educational resources in urban schools, such as technology, is a concrete consequence of unequal funding. "Only 35 percent of black youths ages 3 to 17 use a computer at school. Half of their white counterparts have access to in-school computers" (Wilson, 1997, p. 213). City High is considered one of the district's lower performing and more resource-poor schools.

> Ian: One needs a lot of equipment to conduct demonstrations and labs in the science classroom. City High had equipment for labs, but it was up to me to find it somewhere in the building and to get it to my room. With science teachers spread all over the building and one lab assistant who could never be trusted, supplies were hoarded or lost. Often I had to convince teachers to let me "borrow" supplies that should have been available for all of us to use. In addition, the administration randomly circulated a list for ordering new equipment, but only a few teachers ever saw this request list. My physics classroom at City High School lacked many of the materials to perform the most basic demonstrations and labs. The few textbooks available were in poor condition and obsolete.

In addition to the lack of resources, administrative and practical barriers challenge teachers' ability to access resources in urban schools. As a student teacher, Ian found that there were no standardized procedures for accessing resources. Although resources may have been available, teachers at the school were unaware that they existed.

> Ian: The tremendous lack of communication throughout City High School was apparent to me immediately upon my arrival. City High School was a school with a divided faculty and a history of disorganization, which was hard to dismiss. Tasks such as having a room assigned were not standardized, but rather were dependent upon one being in the right place at the right time. I was lucky in that I already knew important people at the school, but even for me it was a tremendous challenge. As the year progressed I was constantly searching for supplies and equipment that had never made its way up from the basement or out of someone else's room. Teaching robotics, for example, is challenging enough without having to carry each computer up from the basement yourself because no one else will do it.

White teachers and students of color

Student populations in urban areas of the United States are quickly becoming more diverse, while the teaching population has remained demographically unchanged. Currently, the majority of the teaching force in the United States is White, female, middle class, and monolingual. This statistic is similar for new, preservice teachers about to enter the workforce, some of whom will choose to take jobs in urban areas where employment opportunities are most prevalent. For teachers who were schooled in middle-class suburban schools, the cultures, norms and expectations that they encounter in urban schools may be contradictory to those they are accustomed to, or their cultural referents and perspectives may be different from those of their students (Cochran-Smith, Davis, & Fries, 2004).

In the United States, African American students have historically been the targets of discrimination and inequity in education. According to a report that explored racial discrimination in the US public schools, inequity is still a major issue today.

> If the public schools regularly failed to serve students of color in a single aspect of their educations that would be bad enough. What the research reveals, however, is far more pernicious: the cumulative effect upon students of color of an educational experience that channels them away from academically challenging courses, punishes them more frequently and more harshly, and ultimately pushes them out of school without a diploma—all in much higher proportions than their white counterparts. We must face the consequences of racial discrimination in public education in order to ensure educational equity, opportunity, and excellence for all students. (Gordon, Della Piana & Keleher, 2000, p. 1)

Some argue that deficit paradigms shape the way many individuals think about African American students. Ladson-Billings (1994) claims that discourses surrounding African American students have emphasized supposed deficiencies. Terms such as "culturally deprived" and "culturally disadvantaged" used in the 1960s and 1970s promoted the idea of a malevolent culture shared by African Americans and perpetuated the idea that they could not be educated. Even in the 1980s, many people believed that African American students' low achievement was based within the child or the family. Many of these conceptions of inability suggest that African American children may still be seen as "the other:"

> A stubborn refusal [exists] in American education to recognize African Americans as a distinct cultural group. . . . It is presumed that African American children are exactly like White children but just need a little extra help. Rarely investigated are the possibilities of distinct cultural characteristics (requiring some specific attention) or the detrimental impact of systemic racism. Thus the reasons for their academic failure continue to be seen as wholly environmental and social. Poverty and lack of opportunity often are presented as the only plausible reasons for poor performance. (Ladson-Billings, 1994, p. 9)

Embedded in assumptions of deficit are issues surrounding the power and privilege of White, middle-class individuals. Delpit (1995) describes a "culture of power," which contributes to the social reproduction in urban schools. Accordingly, issues of power that emerge in classrooms are governed by codes and rules that are reflective of those associated with the culture of those in power. Thus, "children from middle class homes tend to do better in school than those from non-middle class homes because the culture of the school is based on the culture of the upper and middles classes—of those in power" (Delpit, 1995, p. 25). Many students that attend urban schools are not associated with the culture of power and bring different resources and dispositions into the classroom. Because these resources and dispositions are at odds with White, middle-class norms, such students have less of a chance for success.

Fine (1997) suggests that researchers often lose sight of those who inherit privilege on the basis of their skin color, which ultimately clouds issues of power in education. She provides an illustrative metaphor as a means of describing the problem:

> [W]hat if by keeping our eyes on those who gather disadvantage, we have not noticed White folks, varied by class and gender, nevertheless stuffing their academic and social pickup trucks with goodies otherwise not as readily available to people of color? (p. 57)

Issues of power must be addressed in a society in which 90 percent of teachers are White, yet the student population of urban schools is overwhelmingly diverse. Many teacher education programs utilize a "one-size-fits-all" approach to pedagogy that does not adapt nicely to students outside of the mainstream White, middle-class box. Teacher education programs generally subscribe to and pass on a "factory model" that incorporates traditional, oppressive pedagogies that fail to consider students' cultural ways of being and acting. In addition, many new teachers still cling to the assumptions they have developed about "the other" even as they begin employment at an inner - city school (Swartz, 2003).

"Borders," which may include social, cultural, linguistic, and socioeconomic and gender differences, often function to divide students and teachers. "When educators develop strategies that lessen or minimize the impact of stigmatized social differences, [several] scholars argue, children will trust the teacher and then assent to learn" (Davidson, 1999, p. 339). In Davidson's research, urban students identified specific teacher practices that minimize the impact of such borders. His study concludes:

> [S]tudents are willing to accept a fairly broad range of behaviors from teachers, as long as students are convinced that, in fact, the educator does sincerely care about them and will sincerely make efforts to help them succeed. (1999, p. 365)

This study of Ian, a White, middle class, beginning science and mathematics teacher, and his commitment to teaching a diverse student population from economically disadvantaged communities, speaks to such issues of power. Throughout the chapters, we highlight the ways in which Ian interacts with his students and works to confront power differentials. In addition to using border-crossing strategies and practices, a consistent theme throughout the book is the ways in which Ian builds trusting interpersonal relationships with his students. Later in this chapter, we connect student–teacher relationships to the theoretical constructs of social, cultural, and symbolic capital (Bourdieu, 1987). We use capital in the study to conceptualize the different types of "currency" that Ian used with students to gain their trust and fostered their assent to learn in his classroom. Building and exchanging capital in classrooms has specific implications for beginning urban teachers.

The beginning of the story: Ian's background

Beth met Ian during the spring semester of 2003 while he was a student teacher in physics and math at City High, a large high school in inner city Philadelphia. Because of her interest in studying the transition between one's preservice teacher education program and the first year of teaching in an urban school district, her advisor introduced her to Ian, a student in his science methods class at the university. Over the past year, Ian had been a student in a graduate-level teacher preparation program.

Ian was the perfect candidate for a study that investigated this transition for several reasons. First, he was a twenty-three-year-old White male who grew up in a middle-class suburb of Philadelphia, yet was dedicated to working with underprivileged, urban youth. Beth was very interested in the ways in which teachers form positive relationships with students across the lines of gender, race, socioeconomic status, and ethnicity, and how these relationships can promote enhanced learning for urban students. Second, Ian had taken part in the coteaching model for student teaching, and Beth thought it was critical to explore how this unconventional method of teacher preparation would affect his practices and level of preparation as a beginning teacher. Third, Ian's certification in physics and math would be highly desirable to many privileged and high-paying schools, yet he was committed to working in the School District of Philadelphia. After hearing countless anecdotes about how difficult it is to maneuver through the hiring process in the district, Ian's experiences would be an excellent way to document the challenges qualified candidates face as they seek jobs in large urban districts. Although these issues are salient issues to urban education in general, his story is also an important contribution to science teaching and science teacher education on a broader level. Once Beth began the data collection in his science and mathematics classrooms, she realized that Ian carried out his teaching in ways that were culturally relevant and were congruent to his personality and philosophical views on teaching. Ian's work to reframe his math and science classrooms showed both his agency and the learning potential for his students.

Throughout the text, we focus on Ian's story not as representative of other cases like his, but rather to legitimize the work of an urban teacher and his students in the midst of multiple challenges. To describe the subjective realities of teacher practices, we contend that teachers' stories should be privileged and used prominently in qualitative research. Goodson (1992) describes a common problem in educational research as the lack of teachers' stories:

The general point with regard to knowledge/power that Lortie makes has been a continuing one in the research discourse as related to teachers: a good deal of prescription and implicit portrayal but little serious study of, or collaboration with, those prescribed to or portrayed. (p. 3)

Ian's collaboration in the study and the writing of this text explicitly highlights his voice, which "works against the grain of power/knowledge as held and produced by [the voices of] politicians and administrators," which are typically represented in education (Goodson, 1992, p. 11). Lawrence-Lightfoot (2003) argues that scholarly literature focusing on teachers is often represented erroneously. She considers teachers' reflections, however, as "touchstones for their work."

[Scholarly] literature describes [teachers] as—assumes them to be—neutral, unemotional, and static adults with no interior life, no phantoms from the past, no ambivalence, and no fears. Philosopher Maxine Greene challenges this pervasive view of teachers as bound up in their professional, rationalistic, and objective straightjackets and urges us to recognize the power of their "personal biographies". [Greene, 1973 claims], "The numerous realities in which he exists as a living persona are overlooked. His personal biography is overlooked, so are the many ways in which he expresses his private self in language, the horizons he perceives, the perspectives through which he looks on the world." (p. 8)

Teachers bring their personal histories into teaching, especially their histories as students. Since Ian's personal background and the subjective nature of his beliefs and values play a significant role in his development as an urban teacher, it is important to describe his experiences as a student, his life history, and his prior experiences that helped to shape his teaching. Ian describes the following section in his own words.

About Ian . . .

Born February 16, 1980, I was the second of three boys in the Stith family. I was raised in a middle-class suburb and attended schools in a reputable public school district, approximately 25 miles from the heart of Philadelphia. Once I entered high school, I primarily took honors and advanced placement level courses and was part of the mentally gifted program. Throughout my childhood and adolescence, I participated in competitive swimming and later served as a coach for a youth swim team.

Ian's ethnic background, family, and education

My ancestors were European in general, German, British, Irish, Scottish, Italian, and Jewish. I suppose that I have a general set of European values and family customs, but I cannot attribute them to one group over another. I personally like the fact that I am not related to one group or another because I feel more like I made choices that directly affected me without being held down by tradition. Overall my family lives by a set of morals and standards, but they are not enforced or passed down per se as much as they just seem like basic principles. My heritage has not affected my life choices and the specific values I identify with; however, my family, especially my mother and father, have been a large influence in shaping these aspects of my life.

My father completed some college and currently is the director of the purchasing department of a construction company. I have always felt that my father wanted us to look at things critically and analytically, something he prides himself on. Some of my friends would eat a meal at my house with my family and when it was over wonder what had happened and why had we all been talking about thermodynamics during dinner.

My mother briefly attended college at a traditional age, yet decided to return when her children were older. She has since received her bachelor's degree in chemistry and works as a researcher in a medical laboratory. I am extremely proud of her accomplishment. It says a lot to me about how she feels about school and education. It also made me want to do better and not let opportunities slip away.

In my family, education was important and it was assumed my siblings and I would be successful in school. My parents valued my decision to attend college because of the fact that neither of them had received a degree at that point. I guess it was a big deal that I was going to college. My older brother did not finish, my dad's parents didn't go, and none of his family went, so they probably thought it was a big deal. I did not really see it as a big deal. However, my family did not constantly push me to discuss my postsecondary educational plans. Education was an issue that like other things in my family was not so much dwelled upon constantly but always kept on the burner. I never had the stereotypical conversation with my parents about how they expected me to do well in school and go to this or that college. Instead, the general theme of my family was respect and trust rather than expectations and punishment. My parents trusted me to make decisions for myself and I respected them. I wanted to hear their opinion knowing that I did not have to agree with it. One main lesson I learned from my parents was that there is a point in the relationship that life lessons are

not taught through rules and lecture. Rather, they are taught by talking as equals about issues, where everyone's opinion counts.

When I decided to go to graduate school to become a teacher after studying engineering for four years, my parents encouraged me to go. I talked to them about it, heard their opinions, and then made a decision. My parents have ideas about what they would like to see me do, but ultimately they just want me to be happy and safe. They trust me to be rational and they respect my decisions.

In many ways, my parents engaged in "concerted cultivation" of my educational opportunities in that they responded to my needs even if it meant disagreeing with a teacher. In the United States, "middle class parents are increasingly determined to make sure that their children are not excluded from any opportunity that might eventually contribute to their advancement" (Lareau, 2003, p. 5). Thus, my parents may have felt comfortable negotiating with individuals in the schools, unlike some lower socioeconomic class parents who may see the schools as having ultimate responsibility for educating children. However, my parents incorporated understanding and respect for my needs and judgments.

Experiences in school

In high school, I was a good student. I goofed around, as much as anyone does. But I always listened to the teacher. If I didn't respect the teacher, I didn't put much effort into the class. I did the work, but I didn't help them out, like answer questions. But I usually answered questions. I wouldn't say I was super outgoing but I was not overly shy.

My favorite class was science but I also enjoyed English and history. When it came to math, I enjoyed doing problems, but hated the way the classes were run. I suppose it wasn't so much the subject as the class. Basically they were teacher-centered, the desks set up in rows. We would do work on our own sometimes and the teacher would go through stuff. These classes were really boring. I had teachers that never stood up; they sat the entire time and lectured. And the thing that makes me so angry now is that they still got results. Because they had students like us who were doing the work regardless of what they said. I didn't like those teachers, but I was going to do the work because it was school. And they think they're good, which now is annoying to me.

There was one teacher that I remember from high school that I really liked. In our high school if you wanted to be in the gifted and talented program, you would take a special English class. The teacher for this class was not very strict or authoritarian. We would work individually on projects, read different texts or work on research papers, but it was all very informal. In class we spent a lot of

time just working on our own. We did all sorts of stuff—we did philosophy, history, English, whatever, so it was more of a general humanities class. We also did art history and interpretation. I guess she had a lot of range about what she could do. And she was really laid-back about the class. She didn't do lectures, she did discussions and the room was just a mess, there was stuff everywhere and you could sit wherever you wanted. Looking back on it, as students, we were such idiots in that class. We did not always take the class seriously, which I'm annoyed at myself about now. But she was good because she was really creative. I really appreciated that.

The aspects of the English class that I enjoyed, such as my teacher's laid-back attitude and her creative activities, were essential aspects in my own classroom. In that respect, I think my "apprenticeship of observation" (Lortie, 1975), or the time that I spent observing classrooms as a student, may have been a significant factor in shaping my practices as a teacher.

However, I also had teachers I didn't like. I had one math teacher. He used to coach football, so that was his mentality about math, I guess. And he didn't do anything, I don't even remember his lectures, I don't even know what we did in that class. He never came around or helped anyone; he never did any of that. And, it was basically—that was an advanced placement calculus class, so I guess he assumed that we were just supposed to do the work. This teacher's practices contradicted many of those I found myself using in my own classroom.

My predilection toward student-centered, engaging activities, which we describe in subsequent chapters, may stem partially from my own experience as a student, in which I had opportunities to assess teaching practices that were either effective or ineffective for my learning. In turn, it is easy to see how my experiences in different types of classrooms may have helped me to develop my own philosophy and establish beliefs about the teaching and learning.

The decision to teach

I did not always want to teach. In high school I decided to enroll in an undergraduate mechanical engineering program at Rensselaer Polytechnic Institute in New York. After completing my coursework and an internship with a company that specialized in professional and consumer gardening equipment, I realized that a career in engineering would not be an optimal fit. It was not personal at all. I couldn't see myself being in an office like that. I wasn't motivated there. I liked the topics that I was studying in general but I did not think I would really like the business of engineering.

I had always been a swim coach, and I liked doing that. I really liked working with the kids. I also had a strong social consciousness so I figured

I would like teaching in an urban area. At one point I started thinking about some of those ineffective teachers I had and thought about how maybe I could change things for the better. So I decided to apply for graduate schools for education. I actually applied to several graduate schools during my senior year and finally decided on a university that offered a one-year program for a Master's degree and teaching certification.

I enrolled and planned on becoming certified in both secondary physics and mathematics. In general, my experience in the program was beneficial, however one specific course was extremely valuable. One of the best aspects my graduate work was being in the science education program with Ken Tobin (my science methods course professor and advisor). His courses made it worthwhile—they made me think critically about teaching and learning. Many of the other courses were easy for me, but I felt like I was really challenged with his courses.

Ian's field experiences

Throughout the course of my teacher preparation program, I was involved in multiple field experiences. In my physics placement during the second semester of the program, I cotaught a physics class with one of my fellow student teachers at City High School. After successfully completing my student teaching assignment and required coursework, I graduated and began to look for jobs as either a physics or math teacher. After much aggravation because of the district's hiring practices, I finally secured a position at Leach Learning Academy. Details outlining my preservice teaching experience and the transition to my first year as an autonomous teacher appear in the following chapters. An overview of the different contexts in which I taught is shown in Table 1.1.

Location of the study

Since this book chronicles the experiences of Ian throughout a three-year period of his professional development as a teacher, it is situated in multiple settings. Thus, three locales, which we describe theoretically using Bourdieu's notion of fields (1984), served as sites for observation. We categorize Ian's four transformative teaching experiences as fields. These include his student teaching experience, a summer science curriculum project in which he participated with a group of student and teacher researchers, and his first two years of teaching in different urban high schools—Leach Learning Academy and City High School.

Table 1.1. Ian's teaching experiences

Time frame	School or context	Courses taught or experience
January 2003–May 2003 Second semester student teaching	City High School	Engineering physics (with Jack—coteacher)
June 2003–August 2003	No school: grant-funded science curriculum project	Curriculum development project with 4 students from City High
September 2003–June 2004	Leach Learning Academy	Core Plus Mathematics III (integrated mathematics)
September 2004–June 2005	City High School	Technology, Physics, Robotics, Algebra II, Bioengineering

First, we explore Ian's student teaching, which took place at City High School, a neighborhood high school in Philadelphia. City High School served as the locale for Ian's first teaching experiences, which will be described primarily in chapter two. The second setting for observation was the office space for the Discovering Urban Science (DUS) Research Group. It was there that we worked together as teacher researchers during an eight-week curriculum development project. This setting became a site for observations and interviews, as the experience was a stepping-stone between Ian's student teaching experience and his first job at another Philadelphia high school. It was also an opportunity for Ian to work with urban students in an atmosphere distinct from that of the classroom.

The third location was Leach Learning Academy, a low-performing magnet high school in Philadelphia where Ian taught during his first year after completing

the teacher education program. All of the observations from the first day of school onward took place in Ian's classroom. Since the school year had begun and Ian was spending an extensive amount of time at the school, other means of data collection such as interviews and informal discussions normally took place there. We describe this setting more extensively in chapters five and six.

For Ian's second year of teaching, he returned to City High School. Since his position at Leach Learning Academy was only a one-year appointment, he was able to secure a permanent position at City High School for his second year of teaching. We discuss the changes that Ian experienced upon his return; after only a year, Ian encountered a much different environment than that which he left. We describe City High School in more detail in chapters two and seven.

Theoretical framework

Throughout this book, we explore Ian's agency as a beginning science and math teacher, or the ways in which he accesses and appropriates resources to use to his advantage. Sewell's (1992) conception of structure, another central concept within the theoretical framework, is one that takes into account human agency, or humans' power to act. According to Sewell, structure and agency exist dialectically. Thus, in this section and throughout the analysis we discuss the two constructs in tandem.

Sewell claims that structures "vary between different institutional spheres," making the structures found in education different from those of other institutions. In defining structure, Sewell explains that they are "sets of mutually sustaining schema and resources that empower and constrain social action and that tend to be reproduced by social action" (1992, p. 16). The resources and cultural schema that make up structures are instantiated by each other; resources (which Sewell describes as actual) are the effects of schema (which are virtual). Reflexively, schema are the effects of resources. For example, the actual building that comprises a school infers the schema behind it, or the beliefs and ideologies surrounding societal conceptions of a school. Resources and schema "constitute structures only when they mutually imply and sustain each other over time" (Sewell, 1992, p. 13).

Agency is defined as an actor's power that originates from awareness of schema or control of resources. Therefore, agency is inherently related to the concept of structure. More specifically, it is described as "the actor's capacity to reinterpret and mobilize an array of resources in terms of cultural schema other than those that initially constituted the array" (p. 20). Yet, how one's agency plays out varies according to an individual's social background and surroundings.

Agency can take various forms and is exercised in multiple ways among different people, yet the capacity to exert agency is considered a given for all humans. Agency can also be collective, involving a group of individuals. For the purposes of this study, the dialectic between structure and agency is used to consider the schema and resources that Ian encounters as a new teacher, and how he exercises agency while maneuvering through the urban school system.

Sewell's duality of structure and agency resonates with Bourdieu's work, in which he "render[s] false the structure/agency dichotomy or the fissure in our understanding of social interaction . . . [Bourdieu] believes that actions structure structure and structure structures action" (Horvat, 2003, p. 4). Bourdieu's conception of an individual's social interactions, or one's practices, is linked to one's habitus, or dispositions, ways of being, and tastes or preferences. Furthermore, "[t]he habitus is a mechanism by which individuals develop a sense of their place in the world and the availability or accessibility of a variety of social worlds" (p. 7). In considering these central ideas of our theoretical framework, it is also important to discuss fields as sites where forms of symbolic capital are exchanged.

Culture, fields, and forms of capital

Bourdieu's work provides three important and interrelated constructs in our exploration of Ian's transitions through different phases and contexts of teaching. First, we acknowledge the multiple fields, or "structured spaces of positions (or posts) whose properties depend on their position within these spaces and which can be analyzed independently of the characteristics of their occupants" (Bourdieu, 1993, p. 72). Within each of the larger fields that we mentioned in the previous "Location of the Study" section, we acknowledge that other, smaller fields are embedded. Fields are especially salient for our analysis because they are places where multiple forms of capital are exchanged, even though in each field, forms of capital have different values.

Analogous to economic capital or money, Bourdieu delineates other types of symbolic capital that actors use within a given field as exchange value. Social capital is defined as the social networks or connections an individual might have with others. Cultural capital can be mannerisms, dispositions, or practices that have status value. Educational credentials or cultural goods, such as books or technology, can also be considered cultural capital in its objectified state. Throughout the text, within different fields, we consider the extent to which Ian and the students utilize these forms of symbolic capital. We are particularly interested in how they can be used as exchange value to further Ian's goals as a

teacher; for instance, to help his urban students become more scientifically and mathematically literate.

It is important to also consider how Ian came to know and use the predominant theoretical constructs of structure, agency, and capital that appear as analytic tools throughout the chapters that follow.

> Ian: I was first exposed to the theoretical constructs we use while a graduate student. Fortunately I was able to take my science methods courses with Ken Tobin and he incorporated qualitative research into the course curriculum. Professor Tobin instilled in me the belief that teachers need to conduct research to improve their own skills. During the first semester I felt that some of my classmates had difficulty fully grasping the true importance of research in teaching. I think many of my classmates wanted more direct instruction about how to teach and could not see the long-term effect research would have on their teaching. Professor Tobin introduced us to concepts like agency, structure and activity theory and we discussed how to think about our own teaching using these frameworks. Overall, Professor Tobin took my group of preservice science educators to a level deeper than the other students in my program and taught us how to think differently about our craft.
>
> I would define agency in terms of my own experience in the classroom as a teacher. Teachers and students come together everyday to form the structures the participants exist within and agency works along with these structures. As a teacher it is my goal to do my part to encourage structures to develop for the class that lead to increased agency, meaning that the students feel and are empowered to act. In any given class there are countless resources students can access but that they often are not aware of. As a teacher it is my job to help students see those barriers as loosely constructed. I would define agency, the process of that transformation, from passive listeners to students who can go find the answers and know where to look. Students are too often left out of the learning process—they only appear in the end as an outcome. I define agency as the incorporation of students into their own learning and the learning of their classmates.

Throughout the chapters that follow, we continue to utilize structure, agency, and capital as lenses through which to explore Ian's experiences in the classroom. Across fields, we use these constructs to analyze Ian's practices and those of his students.

Is Ian unique?

The chapters that follow, at times, portray Ian as a "unique" teacher. In many ways, he shows characteristics atypical of many preservice and first year teachers. For instance, he does not seem care about the higher salary he would receive if he worked in a suburban school. Rather, his motivation is dictated by his desire to work with urban kids. On one hand, this devotion may seem atypical of most teachers, especially those that are accustomed to suburban, middle-class schools. However, one might hope that all teachers would have some level of commitment to helping all students achieve. Therefore, we believe that Ian's case may be somewhat unique; however, throughout the book, we do not attempt to portray him as an anomaly. Instead, we highlight the challenges Ian faces as he begins his career while focusing on the ways in which he accesses resources to achieve his personal goals. Clearly, his case is an important example of urban science and math teaching and the induction period for beginning teachers in an urban district.

There are some obvious ways in which Ian is unique, for instance, in that he is interested in researching his own teaching. Throughout the multiyear study chronicled in this book, we have worked together to collaboratively research Ian's practices and other aspects of teaching and learning in the science and math classroom. Because of our collaboration as researchers, Ian's voice as a coauthor is a significant aspect of this book. Although the original research questions were posed by Beth, our collaboration on the project provides both an etic and emic view and hence, multiple constructions of the phenomena observed.

Overview of the book

In the first chapter, we discussed some of the current dilemmas that teachers face in urban schools. Some teachers may be under prepared and unaware of the misfit they may encounter in urban schools due to the diversity of the student population. We focus primarily on African American students and White teachers to mirror Ian's experience. Each of these issues and challenges collectively serve as a backdrop to explore the case of a beginning math and science teacher in a struggling urban district. In an effort to give readers a better understanding of Ian's background, we elucidate key biographical aspects including his experiences in school, his family's role in his education and his decision to become a teacher. Several theoretical lenses to be woven throughout the book are introduced briefly, each of which stems from cultural sociology.

Chapter two gives an overview of the first field in which Ian begins to build his practices as a beginning teacher. After describing the general climate of traditional teacher education in the US, we explore his experiences in a graduate-level preparation program. We describe Ian's experience as novel because of his opportunity to participate in the coteaching model with a fellow student teacher. Specifically, we explore Ian's use of coteaching and cogenerative dialogue as a means to initiate collaborative research on his teaching practices. We also decipher the division of labor that served to structure the classroom, and how it affected the classroom participants' agency. Throughout the chapter, we define the patterned practices that emerged in Ian's teaching.

In this chapter, we describe Ian's experiences working on a summer curriculum development project with four African American youth from City High School. We focus on Ian's interactions with the students and his ability to build bridges, or social and symbolic capital, with the students over the course of the project. We consider this experience a second field in Ian's trajectory as a beginning teacher and describe the understandings that Ian reaches as a result of his work on the curriculum project.

This chapter illuminates the obstacles Ian faces while attempting to secure a teaching position in the School District of Philadelphia during the summer after his student teaching. We first describe some of the issues and policy changes brought about by a state takeover that occurred within the district around the time that Ian applied for a position. Ian's experience, which proved to be chaotic, confusing, and full of miscommunication, is an important story for other new teachers that are considering seeking a position in a large, urban district. We also describe Ian's second experience with the centralized hiring and school selection process between his first and second years of teaching in this chapter.

Against several institutional structures that Ian encounters in his first teaching position, we describe several means by which Ian's agency as a first year math teacher at Leach Learning Academy, a magnet high school within the district. We first discuss the structural changes that Ian encounters in transitioning between City High School and Leach Learning Academy. Then, we present the patterns that emerged in Ian's practices, such the individualized instruction he provided for his student during class time. We also explore the relationships that Ian builds with students in his first period math class and their affect on Ian's work as an educator.

Chapter six expounds upon a particular practice that emerged in the data analysis: Ian's methods of teaching math "in a science way." We found that his attempts to reframe his mathematics course resulted in increased student

engagement and understanding. This chapter includes descriptive vignettes and photos of various activities that Ian utilized throughout the year.

Since Ian's position at Leach Learning Academy was only a temporary, one-year assignment, he was forced to endure the district-wide selection system a second time. Luckily, he was able to procure a position at City High, where he had cotaught with Jack during his student teaching. Chapter seven illustrates the structural changes that Ian encounters as he returns to City High School. We also describe Ian's teaching practices in his Algebra II and robotics courses amidst the emerging challenges he faces at City High.

In this final discussion chapter, we trace Ian's teacher practices longitudinally and assemble patterns that show coherence over the fields described in each of the data analysis chapters. We return to the questions we described in chapter one and discuss them in terms of Ian's experiences over two and a half years. In addition, we evaluate the study using Guba and Lincoln's (1989) authenticity criteria for qualitative research. We argue for several changes on two levels: within teacher education programs and within urban districts. Finally, we conclude the book with a short metalogue that addresses the understandings that we gained as a result of the research and the writing of this book.

Making stories explicit

We believe that individuals enter the field of teaching for a variety of reasons. Among them, it seems that a dedication to achieving social justice drives those who desire to teach in the inner city. For Ian, his commitment to social justice was an important impetus for choosing to work in an urban setting. However, as we see in subsequent chapters, the challenges inherent in teaching in urban schools served to directly challenge his idealism. Although Ian's story highlights his agency, some of the structures with which he interacts become challenges and at times seem insurmountable along the way.

In order to address the issues faced by urban science and math teachers as they struggle to foster scientific and mathematical literacy for all students, their plights must be explored. From such cases, teacher preparation programs can be framed by a realistic illustration of the field and include meaningful experiences for teacher candidates. The student teaching experience is only a partially accurate portrayal of what beginning teaching is like; frequently it is extremely different than what teachers will come to experience when they step into a classroom on their own, with little support. This book serves to identify the issues that Ian faced and highlight some of his successes in the classroom as he maneuvered through structures in multiple, dynamic fields. For some, it may dispel

some of the stereotypes about urban students and schools that are perpetuated in society. For others, it may reinforce some of the existing research on the challenges and problems within urban schools. On some level, we believe that it will enable multiple audiences in the field of education to gain understandings from an illustrative portrait of an individual becoming an urban science teacher.

2 Learning to teach by coteaching

In this chapter, we describe Ian's initial teaching experiences at City High School, where he cotaught a physics class a fellow preservice teacher. Ian's student teaching experience can be visualized as the first field, or social space, to be analyzed in his trajectory from student in a teacher education program to second-year teacher.

Ian's preservice teaching experience differed from that of the traditional teacher education program in several ways. First, rather than the typical student teaching experience in which one takes over the classroom of a more experienced cooperating teacher for a semester, Ian cotaught many of his classes alongside a veteran teacher or another student teaching intern from September to May. In this chapter, we discuss his experiences teaching with Jack, a fellow student teaching intern, in an engineering physics class. Second, Ian's practices as a student teacher included opportunities for him to do collaborative action research on his own practice. Third, Ian participated in cogenerative dialogues, in which students, teachers, and other individuals in the school community came together to discuss shared events in the classroom and come to agreements about aspects that could be improved or changed. Ian's use of cogenerative dialogue in the classroom setting has many implications for individuals interested in reflective practice and building community in the classroom. These unique processes and their implications will be discussed throughout the sections that follow.

It is important for teacher educators, educational researchers, and those considering a career in teaching to contemplate the efficacy of alternative experiences in teacher education, especially those that provide opportunities for extensive reflection. This chapter seeks to provide a rich description of such innovations by contextualizing them in Ian's experiences, while offering an analysis that considers the patterns of coherence and contradictions that ensue as he begins to teach in an urban high school.

Traditional teacher education in the United States

It is difficult to establish what the typical teacher education program looks like in the United States due to the varying philosophies that drive programs in institutions of higher education.

> There is no single phenomenon, no monolith called "teacher preparation." So while the phrase "teacher preparation" seems familiar to us all, it is falsely so, for teacher preparation means many different things across the United States. (Wilson, Floden & Ferrini-Mundy, 2001, p. 7)

Currently, approximately 1,300 traditional teacher education programs exist in colleges and universities across the United States. Logistically, some colleges and universities offer four or five-year Bachelor degree programs. In others, students seek both a Master's degree and teaching certification. Some argue that the latter, which typically include a full year student teaching internship, are more successful in preparing teachers than the typical undergraduate program (Darling-Hammond & McLaughlin, 1999).

Most traditional teacher education programs incorporate subject matter, pedagogy, and foundations courses along with one or more field experiences. In many programs, a "knowledge base for teaching" pervades the curriculum. This knowledge base should "frame teacher education and directly inform teaching practice" and should be informed by specific "content, character and sources" (Shulman, 1987, p. 4). Within his model, teachers must be knowledgeable about content disciplines, educational materials and structures, formal educational scholarship. Additionally, teachers must have wisdom of practice, or the ability to know what to do in a given situation.

The National Council for Accreditation of Teacher Education (NCATE) calls for six standards that should frame successfully accredited teacher education programs in the United States. Each of these standards has been incorporated into a rubric for assessors to use in evaluating teacher education programs for NCATE accreditation. These standards include: candidate knowledge, skills and dispositions, assessment system and unit evaluation, field experiences and clinical practices, diversity, faculty qualifications, performance and development, and unit governance and resources. To become accredited, NCATE requires programs to initiate direction and a shared vision and means of accountability for teacher education programs (NCATE, 2002). Thus, as teacher education programs seek accreditation and begin to incorporate the standards into courses and fieldwork for preservice educators, the possibility of a more uniform teacher education experience in the United States may emerge.

Today, most teacher education programs incorporate the idea of learning in practice in order to align theory and research-based methods to practical teaching experiences. Forming a bond between theory and practice that is based in experience presents teachers new frames of theoretical reference and provides "behavioral enactments that accompany these ideas" (Kennedy, 1999, p. 71).

Another rationale for learning in practice is its effect on student learning. In an era driven by national, state, and local standards that require students to utilize higher-level thinking skills, teachers need to be well equipped to facilitate inquiry-based learning environments. In order to grow professionally and better meet students' needs, teachers should be willing to do further inquiry into their own practice. Rather than merely learning *about* teaching in courses, a situated practice approach to teacher education fosters preservice teachers' abilities to problem-solve. Teacher education must evolve to allow teachers to "become serious learners in and around their practice, rather than amassing strategies and activities" (Ball & Cohen, 1999, p. 4).

Overall, a critical aspect within many programs is the idea that "teachers learn about practice in practice in settings that deliberately construct integrated study of content, learning, and teaching and create strong connections between theory and practice" (Darling-Hammond & McLaughlin, 1999, p. 378). In any realm of teacher education, whether it is at the programmatic level, or within a science teaching methods course, learning in practice is essential. As we illustrate in the following section, the coteaching model offers a novel twist to teacher education that fosters inquiry and reflection *while* learning in practice.

Learning to teach by coteaching

Why coteaching?

Coteaching emerged when Roth and Tobin (2002) considered a few of the challenges that new teachers face as they begin working in urban schools. First, they found that the dispositions and practices of the middle-class preservice teachers with whom they worked were not in alignment with those of urban students (Roth, Lawless & Tobin, 2000). A second impetus for the incorporation of coteaching was to bridge the gap between theory and practice within teacher education. Even though most teacher education programs value the notion of learning in practice, which we described in the previous section, a disconnect between theory and practice is fostered when education courses and field experiences are discrete entities (Roth, Lawless & Tobin, 2000).

A third motivation for coteaching came from problems related to the tacit knowledge needed in everyday teaching. Enacting the planned, conscious aspects of teaching is challenging for new teachers as they negotiate many unknown aspects of the classroom. New teachers worry that they will not have the immediate sense of knowing what to do in a particular situation without opportunities to stop and think extensively about it (Roth, Masciotra & Boyd, 1999). Teacher educators typically spend a great deal of time working with preservice educators on the more conscious elements of teaching, such as lesson planning, the creation of quality, inquiry-based activities, appropriate assessments, and clear-cut classroom management strategies. However, preservice teachers often struggle with the momentary, unconscious practices that they must draw on to be successful.

The concept and practice of coteaching addresses these issues directly as it provides opportunities for preservice teachers to learn in practice. Coteaching, as defined by Roth and Tobin, is "a practice that allows teachers to have shared teaching experiences (including planning, enacting and reflecting on curriculum); these experiences then provide the groundwork for meaningful professional conversations" (2002, pp. 1–2). Several studies have shown the efficacy of coteaching as a way to afford improved preparatory experiences for beginning teachers (Eick et al., 2003; Roth, Tobin & Lawless, 2000; Roth & Tobin, 2002, 2005). In essence, Roth and Tobin purport that the most important knowledge for new teachers is constructed "when teaching occurs." They argue that coteaching serves as an effective tool to situate learning in practice.

Theoretical underpinnings of coteaching

In theorizing coteaching, Roth and Tobin (2002) describe a praxeology of teaching that draws on the Greek etymology of the word (praxeology: praxis, action and logos, talk) and rests on the concepts of *Being-in/with*, *Spielraum* and *habitus*. Overall, the concept is guided by sociological phenomenology, which can be described as:

> Knowing and learning in everyday praxis. . . . Theories of knowing and learning grounded in phenomenology presuppose being-in the world (as a body among bodies) as the fundamental condition of all knowing. . . . Through our bodily inclusion in the world (e.g., in classroom and school) we are therefore subjected to a process of socialization in which the formation of a (teacher) Self is itself a product. The social is grasped as lived experience, through day-to-day praxis, and the singularity of the 'me' is worked out as an individual enacts and emerges from each social relationship. (Roth & Tobin, 2002, p. 9–10)

Phenomenology accounts for coteaching in and with others as a means of learning through interactions. Frequently, the socialization of teachers is an autonomous act. Coteaching, on the contrary, encourages the negotiation of meaning through experiences with others. In this, new teachers engage in meaningful interactions and reflections with and among others in the profession (Roth & Tobin, 2001).

The concept of *being in/with* builds on the concept of phenomenology as we are individuals among others in the world, and learn both in and with others; the "co" in "coteaching" is dependent on this idea as it serves as a means of experiencing social relationships through interaction. Therefore, as Ian worked with others (by participating in the activities and practices that make up teaching or as a body among bodies), learning opportunities were afforded to him as well as the other coparticipants. Moreover, the concept of *being in/with* aligns perfectly with the need for a connection between theory and practice. Through coteaching new teachers have the ability to learn in practice teaching situations with others (Roth & Tobin, 2001).

Spielraum or the "room to maneuver" is another aspect of the praxeology of coteaching. Spielraum, initially described by Heidegger, is a type of tacit knowledge that good teachers develop as a means of thinking in action. This knowledge is not conscious; rather, teachers use it in praxis as a function of being-in the classroom. It is described as

> the range of action possibilities available to the agent at any one point . . . [a]n extended Spielraum provides more possibilities for action without stopping to then reflect on what to do next. Spielraum arises from a practical sense, which locates the next move in the unfolding situation. (p. 749)

Thus, in conjunction with the other ideas presented as part of this praxeology, beginning teachers' development of Spielraum is increased in the coteaching experience.

Habitus, as mentioned earlier, is the third concept to make up the praxeology of teaching behind coteaching. It ties to being-in the world because of the meanings and dispositions that one acquires by participating with others in structured fields. Dispositions may not be singular entities, but instead embedded within "systems of dispositions" that create the "patterned ways we interact with the world" (p. 749). For example, Ian's habitus of a White, male, middle-class teacher is dependent on the web of regularities in his world as a teacher. His habitus has developed through his own schooling, his teacher education courses, and the practical experiences he has had by being-in situations and

being-with others. Habitus is "accompanied by interests, strategic calculation of costs and benefits, and . . . other concerns prevalent in the situation" (p. 750). Consequently, habitus helps to shape one's actions in certain situations and thus plays a highly influential role on one's practices in the classroom.

The ideas mentioned here work together to configure the act of "becoming-in-the-classroom" that many teacher education programs lack. Also, the ideas of being-in/with, spielraum and habitus coalesce to form a praxeology, which is integral to coteaching and is strongly supported by the post-action reflection involved in cogenerative dialogue. This "praxis-situated way of understanding teaching" was developed with the intention of "replac[ing] the traditional methods and methodological instructions that are fraught with theoretical and practical problems" (Roth, 2001, p. 16).

Cogenerative dialogue and coteaching

In cogenerative dialogues, coteachers, student teaching advisors, students, vateran teachers and others critically discuss the events of the teaching situation in an effort to transform teaching and learning in a given field (Roth, Lawless, & Tobin, 2000; Tobin et al., 2003). Cogenerative dialogues offer preservice teachers additional opportunities to reflect, develop, and gain understandings based on multiple perspectives. In cogenerative dialogues, connections are made between theory and practice and an immediate analysis can take place regarding the activities in which all participants were engaged. When cogenerative dialogues occur moments after teaching, the immediacy of the discussion accounts for the rich data that can be acquired. Regardless of when they occur, each of the stakeholders in the teaching situation becomes an active researcher and meaning-maker. In recent work by Roth and Tobin the concepts of coteaching and cogenerative dialogues are discussed reflexively (see Roth & Tobin, 2005).

Collectively, coteaching and cogenerative dialogue support a praxeology of teaching or the "local knowledge about teaching and learning created by participants (teachers, students, new teachers, researchers, supervisors, and evaluators) in the process of talking about their shared experience" (Roth & Tobin, 2002, p. 317). Hence, experiences are shared through coteaching, which stimulate professional discussion in which new ideas about teaching and learning emerge. Cogenerative dialogue can be a means of attaching theory to practice or vice versa as it allows all stakeholders in the situation to have "democratic construction of (open) theory, [which] provide[s] the context in which significant learning

occurred" (Roth et al., 2002, p. 254). It is through cogenerative dialogue that one's teaching practices can be reflected on, refined or transformed.

How does such a model play out in a teacher education program? Since coteachers are constantly *in* a classroom *with* others, opportunities for reflective practice and collaborative work clearly emerge. In the following sections, we explore Ian's coteaching experience in an effort to assess how it served to shape his teaching practices. Throughout, we consider the agency of the collective (both students and teachers) since the teaching structure is altered from the traditional singular teacher arrangement to one that involves multiple participants. We also illuminate the patterns that emerged in Ian and Jack's particular coteaching arrangement with regard to the division of labor and the ethos of collaboration that ensued.

Doing research on coteaching at City High School

The context

Starting in January 2003, Ian began his coteaching experience in a second semester engineering physics class at City High School. Jack, another student in the teacher education program, was selected to coteach with Ian because of his similar background in engineering. Both were seeking certification in secondary physics and mathematics. Ian and Jack had begun their student teaching during the previous semester, which ran from September until December. Both experienced varied teaching scenarios with several cooperating teachers during the first semester. Ian cotaught physics and math with experienced teachers at City High. He also taught a middle school math class at another local school. Jack taught math independently and cotaught physics with another student teacher at City High.

> Ian: From the beginning, I was excited to begin a new semester and start coteaching with Jack. Coteaching with the certified teachers was a good introduction, but I still felt like I was trying to fit into his or her way of teaching rather than actually creating the structure of the class. I think the teachers I taught with had previous experience with student teachers and had some hesitation about coteaching as a preparation method. However, I felt that Jack and I would work very well together. Also, in a strange way, I felt that might help Jack look at teaching in a new way.

City High School is considered a neighborhood, comprehensive high school, which any student in the district can attend. In 2003, the school's total enrollment was 1,862 and about 99 percent of the students were African Americans. City High students' scores on the student achievement test (SAT), a standardized test that students must take to get into college, were at the lower end of the ranking system for the area. Students received an average verbal score of 348 and math score of 355 points (based on a 700-point scale for each). However, of the total enrollment, only 51 percent of students took the SAT. The average class size was 20 and the guidance counselor to student ratio was 466:1.

According to City High School's organization, students and teachers were divided into small learning communities or schools within a school, each with a different theme. Students at City High School switched courses halfway through the year in a manner consistent with a traditional college schedule. Thus, Ian and Jack began teaching the course at its inception in January with a new group of students. Mister Springer, a vocational education teacher who specialized in automotive repair, was scheduled to work with them as the experienced cooperating teacher. Needless to say, the absence of a cooperating teacher certified in physics was one factor in creating an unusual structure for their experience. Technically, Mister Springer was the teacher of record for the course, although he did not contribute to its initial planning.

The engineering physics class met daily for a block period from approximately 1:00 P.M. until 2:35 P.M. Of the twenty-four students in the class, most were juniors in the SEM^2 (science, engineering, math, and motivation) small learning community. To take this particular course, the students should have taken a basic physics course beforehand, but realistically there was no prerequisite to be placed in the class. In fact, many of the students had taken the basic physics class that Jack had taught the previous semester. Therefore, Ian and Jack decided to begin with concluding topics from the previous physics course. Jack and Ian decided early on that it was vital for the students to understand the engineering process, such as identifying a problem, designing a solution, and refining a design through testing. With this goal in mind Jack and Ian incorporated various projects that stressed group work and design skills.

The coordinator of the small learning community, who was also a chemistry teacher, conceived the class to provide students with an introductory engineering course and to encourage students' interest in the field of engineering. The course design brought together elements of physics, engineering, and robotics.

Figure 2.1. The large classroom where Ian and Jack cotaught the engineering physics class.

The data

For this phase of the study, video data, interviews, and artifacts were primarily used. Approximately fifteen hours of video data were collected in Ian and Jack's fifth period engineering physics class. Classes were taped one or two times per week during a period from February until April of 2003. Since the classes were ninety-six minutes long, usually two (one-hour) digital videotapes were used to capture the entire instructional period. The camera was positioned on either the right or left side of the classroom so that all areas of the classroom could be seen. The classroom was made up of two spacious laboratory rooms that could be divided by a folding wall structure. The students worked at the small lab stations since student desks were not available in the room (Figure 2.1).

Although video was the main source of data for this phase of the study, Beth also conducted multiple open-ended interviews with Ian. These were used as an additional source of data. Jack also participated in one of the interviews. All interview data were transcribed and analyzed for coherence with and contradictions to the patterns that emerged in the video analysis. Other data used in this part of the study included informal communication with Ian, Jack, and other peripheral participants in the study, such as Mister Springer, Ian's and Jack's cooperating teacher, Sonya, their student teaching supervisor, and the engineering physics students.

Video analysis

We primarily analyzed data surrounding mesoscopic phenomena, or events that occurred in real time, throughout our study. One of the easiest means of distinguishing between levels in data analysis is through the use of Bourdieu's fields (1984). At the mesoscopic level, we look for patterns in one particular field, e.g., the chemistry classroom. We explore the same field spatially. However, we seek patterns that occur in life as it unfolds naturally.

> Meso level claims rely upon traditional ethnographic analysis, and emerge when everyday unfolding events are captured as data resources, through recordings, field notes, journaling, or interviews. They arise from being in the classroom or from watching videotape footage at real time speed. (Seiler & Elmesky, 2005, p. 42)

At the mesolevel, we observed interactions between the participants over the course of the project and sought both patterns and their contradictions that took place over a broader temporal range. For instance, Shakeem, one of the student researchers with whom we worked, would often shut down and stop participating in an activity if he did not find it enjoyable. We considered this practice a significant pattern at the mesolevel since it often crossed fields temporally, yet was specific to one individual and one spatially organized field.

The video data collected through the course of this study was largely considered substantive for meso and microlevel analyses. We used microanalysis at times throughout the analysis to further explore the interactions the participants—especially in our analysis of conversations or interviews. "The micro level involves the interactions of individuals with resources and the unfolding of action, as praxis" (Tobin, 2005, p. 49). With digital video editing software, we were able to do an in-depth analysis of the interactions by watching the film multiple times at slower speeds.

Although we focus mostly mesolevel phenomena, some of the implications for this study are framed within the macrolevel, which provides a perspective that encompasses multiple fields. At the macrolevel, we look for patterns that extend over the porous boundaries that separate particular fields. Generally, such patterns are significant over longer periods of time and across locales. "The macro level involves participation in more than one field, including schools, where fields are nested within one another and intersect to create complex organizations" (Tobin, 2005, p. 49).

Easing in to teaching

Aside from the benefits of coteaching described in the literature, Ian described his experience as a great precursor to teaching alone because of the support inherent in shared responsibility. In this section, we describe the ways in which coteaching enabled Ian to ease in to teaching and reflect with others. We also discuss the added benefits of coteaching for students.

Easing in to teaching

Before stepping foot into the classroom, Ian had the fortunate experience of working with children as a swim coach. As a coach, he had many hands-on experiences with children that were very similar to those he would experience in teaching, such as giving instructions to a large group, dealing with problems as they arose, and building rapport with youngsters on a one-on-one basis. For other new teachers, however, the first days of student teaching are overwhelming. Preservice teachers must switch roles and become leaders in the classroom, after a long period of playing the role of student.

Teaching involves many instances in which one has to quickly assess situations and make immediate, in the moment decisions, which can be difficult for new teachers. One of the arguments for coteaching is the enhanced ability for teachers to transition into the teacher role. Sharing the teaching responsibility with another individual enables added "wiggle room" and also allows someone else to step in and help out when needed. This change in structure from the traditional teaching arrangement fosters coteachers' agency to accomplish the duties involved in their new roles as teachers. Ian mentioned the increased opportunities he had to perform a variety of teaching activities because of Jack's presence:

> It was like we were able to do what we wanted because we always had someone there. It was like, I wanted to do certain things, and Jack wanted to do certain things, but since we were both there, it was easier for us to do those because the other person was always handling the other things. (Ian, interview transcription, 1/21/04)

Because Jack was there to lend a helping hand, Ian was able to get involved in authentic teaching experiences. At times, Jack cleared the path so that Ian could explore new terrain in the classroom, and vice versa. Jack also explained this as a great opportunity to build routines that enabled the class to run smoothly. He felt that elements of the class such as checking homework and

transitioning between activities were easier to accomplish with the presence of Ian.

This concept of added wiggle room led to Ian and Jack's willingness to take risks and try different activities in the classroom. Coteaching allowed small mistakes or missed opportunities to be addressed immediately. For example, Jack could jump in at any time to add to or refine a description given by Ian. Additionally, Jack and Ian supported each other to try different assessment techniques, such as performance-based assessments.

Reflection with others

Throughout his coteaching experience, Ian had vast opportunities to reflect on and discuss classroom events immediately after or during their enactment in informal conversations. Ian was quick to describe the value of having others with whom to reflect.

> Oh yeah, [Jack and I] were always talking. That's what I miss [now that I'm teaching by myself], because I don't have anyone. You don't have anyone saying, "Well, what could we have done better?" And then other teachers that come in just to watch, they don't know what I'm trying to do. Whereas Jack and I were like, we want to get them to do such and such and then we would say, hold on, maybe we need to change that. And that, that's the thing. That's the issue, really. (Ian, interview transcription, 1/21/04)

Throughout Ian's coteaching experience, he would maximize his reflection by discussing his thoughts and ideas with Jack. Engaging in dialogue on a shared event, such as a particular activity, assessment or interaction with a student, enabled the two of them to come to new understandings about their work in the classroom. Later in this chapter, we describe several opportunities that Ian and Jack had to discuss their teaching practices and meaningfully reflect together. Collectively, Ian and Jack could give each other support and feedback that could be used as a resource to transform their teaching.

Two classes in one

One group that clearly benefits from coteaching is the students; having two teachers in the classroom changes the structure of the field and allows them access to additional human resources. For instance, as Jack lectured, Ian was able to circulate throughout the classroom, check for student comprehension, and answer any questions that had arisen during the lecture. Students could immediately ask for clarification on a topic as it was being taught. Also, students had access to two different types of teachers throughout the period. If a student did

not fully understand a concept explained by Ian, he or she could draw on Jack's perspective for an additional explanation. Thus, the diversity of perspectives fostered by coteaching often enabled students to better understand the engineering physics curriculum.

Additionally, coteaching allowed Jack and Ian to split a large group of students into smaller, more intimate groups, which created a smaller teacher to student ratio. Because of the large space available in their classroom, the coteachers could involve students in two different activities, such as a lab and a demonstration, at the same time. In one of these scenarios, Jack and Ian split the class into groups and worked with them individually for the majority of the period. Jack facilitated a lab involving springs and Ian worked with students to help them graph equations. Both were able to easily control and engage their group of students and had the opportunity to do some autonomous teaching. Restructuring the class into two smaller classes enabled both the coteachers and the students were to appropriate resources to foster learning in multiple ways.

The division of labor

In past studies that have examined coteaching (i.e., Tobin et al., 2003) a division of labor, which stems theoretically from cultural-historical activity theory (Engström, 1999), typically evolves among the participants. Within this division of labor, participants enact practices that become patterned and can be described as roles. A set of rules (both implicit and explicit) that govern participants' involvement and focus on shared outcomes also structure the organization and actions of coteachers within this division of labor.

> In whole class activities it is customary for one coteacher to assume central roles while others have peripheral roles and an understanding of when and how to step forward to assume a central role as the unfolding events of the classroom present opportunities for them to afford the collective learning of the community. (Tobin et al., 2003, p. 52)

This description of division of labor complements the tenets of the structure/agency dialectic. Coteachers use agency when they "step forward to assume a central role" because of the constantly unfolding structure (or "events of the classroom"). The unfolding structure, for instance, as teachers step forward as resources, offers opportunities for the collective agency of the participants (the coteachers as well as the students) since all individuals in the community have enhanced learning opportunities and can access learning resources in additional ways.

As Jack and Ian grew increasingly comfortable in their new arrangement, patterns in the video data suggested an apparent division of labor. Both teachers were involved in appropriate classroom activities during the entire instructional period; however, each typically gravitated to specific roles. Jack often spent more time during each class period at the board in the role as lecturer, while Ian spent more time circulating around the room and talking to students individually or in small groups. Contradictions to these patterns were also evidenced in the data, for instance, when Jack would circulate or Ian would deliver part of a lesson at the board.

Jack's roles and practices

Two particular patterns emerged in the data with regard to Jack's practices in the engineering physics class. First, Jack often took the lead in orally presenting the content of the lesson. Second, he took the lead in organizing activities in the lesson and maintaining class time efficiently. Using digital video editing software, we clipped many segments in which Jack raised his voice to quiet the class, walked up to the board and began lecturing about the topic of the day. For instance, during one class period in the beginning of the semester, Jack began by clarifying the instructions for the "do now" or warm-up activity that had been written on the board as the students entered the room. As he gave the instructions for the activity, Jack stood at the front of the room, while Ian took a peripheral role at the back.

In the exchange that follows, Jack led the class in trying to reach a consensus on the weight of the students' participation grade. After the students were assigned the task of creating a rubric for a project, Jack and Ian attempted to facilitate a discussion about it.

Jack:	[What changes need to be made] to the participation and the group work grading scale. Any, any changes to that sheet that you were graded on?
James:	((*Looks to Ian*)) What's he talkin' about?
Ian:	↑We're talkin' about number two, on the do now, anyone want to vocalize [(what?)
Jack:	[Are there any changes, deletions, additions, to that group work grading scale.
	(Video transcription, 2/23/03)

In this vignette, Jack took the lead in motivating the students to give input on one of the class structures—the weight of participation on a rubric for group work. Previous to Jack taking the initiative at the front of the room, the students

were talking amongst themselves. It was not clear whether they were actually working on the "do now" activity. Jack saw the opportunity to refocus the class and took advantage of it by taking a central role. To do this, he stood in the front of the room near the chalkboard where the activity's instructions were written and commanded students' attention by speaking loudly above their voices. Although Ian echoed Jack's directions for a student that was sitting close to him on the side of the room, it was clear that Jack took the lead role for keeping students on-task and for clarifying the instructions.

During another class period, the students worked on equations to find the velocity of an egg as it dropped to the ground. At one point during the lesson, two students were at the board, working on one of the equations. After negotiating the problem by themselves for a few minutes, Jack addressed the students at the board about the problem.

Jack: Um, alright, yeah, you need uh, well, what happened to the seconds, when you multiplied ten meters per second square times one second.

Student: The seconds crossed off.

Jack: What's that? How did, how did you get—the answer you originally wrote, how did you get that?

Student at board: ((*Second student at the board moves away to watch*)) Oh, cause I did ten meters per second squared times one second.

Jack: And what happened to the seconds?

Student at board: One crossed off.

Jack: One crosses off. In the first one two crossed off. In the first one two crossed off because t was squared, right? ((*Walks up to board and points to part of the first equation with a marker)) ((During Jack's explanation, the student at the board anxiously moves around, yet continues to stay close to the board*.)) T squared, so seconds squared crosses out with this seconds squared. This is a different equation though. T isn't squared here so he's only got seconds to the first power, one second numerator crosses off with second squared in the denominator so he's left with one. It looks like this in terms of fractions, ten, I would write your units so that the sec, the units are in the denominator as well, so that you can see how they cross off. ((*Ian walks up and stands to the left of the board where Jack is teaching—see Figure 2.2*))* Right, this, multiplying these two together is the same thing as saying seconds over seconds squared, and that's equal to one over seconds. Okay. So we're left with v f equals ten meters per second. ((*Student moves away from the board*)) How does that compare to yesterday's solution?

Ian: Bill?

Bill: I didn't hear the question.

Jack: How does that compare to yester—thank you. (?)
Bill: Same answer.
Jack: Same answer. Did we use anything in terms of energy here?
Student: No.
Jack: None.
Ian: Did we need the mass? We need the mass?
Jack: ↑What happened to the mass in yesterday's equation?
Student: They canceled out.
Jack: They canceled out. Is it any surprise then ((*Ian walks away from the board, his arms folded across his chest*)) that mass is not even in these equations and we can still get the answer.
Student: No, (?)
Jack: All right, very nice. Now did anyone else get a different answer?
(Video transcription, 2/23/03)

In this vignette, Jack took the lead to show the entire class how to solve the equation successfully. After several students asked questions about the problem, Jack actively changed the structure of the lesson. Instead of watching the students work independently, he took the central position at the board to offer a clear explanation and to walk the students through the problem. Ian attempted to subsequently change the structure in the moment of Jack as the solo lecturer by walking up to the front of the room and posing a question to the class. However, Jack maintained the central role by rephrasing the question louder than Ian. Jack's central role is further depicted in Figure 2.2 below; Ian's posture and gaze suggests his role as an onlooker while Jack takes the lead in explaining the problem.

Throughout their coteaching experience, Jack assumed the more central role of "lecturer" or "explainer" and often seized opportunities to speak to the class as a whole. An interview with Ian confirmed Jack's tendency to lean toward this role.

Beth: Did you see yourself falling into particular roles? Like you would do the same things and he would do the same things?
Ian: Yeah, Yeah.
Beth: Because I notice that on the tape, but I'm just interested to hear what you thought.
Ian: I think so, because he's more of a lecturer and I'm not. So, he usually did that. And he felt more comfortable doing that, so it just naturally would occur. And I noticed—I mean, I noticed that stuff—and I was like, Jack always does this part.
(Ian, interview transcription, 1/21/04)

Figure 2.2. Jack (far right, pointing to the board) lectures while Ian (far left) looks on.

Ian's comments acknowledged that Jack's actions in the classroom, specifically his practice of lecturing or explaining concepts to the entire class, were aligned with his comfort. In the division of labor that ensued, Ian's final comment, "Jack always does this part" suggests that Jack took the lecturer role more frequently. Ian also mentioned that he did not identify himself as a lecturer, which was also confirmed in the video data. Later in the interview, Ian mentioned that, "[Jack] usually did the stuff at the board." In this case, the teacher's position in the classroom was a strong indicator of the role he was taking. Standing in the center of the room, in front of the board signified a central, lecturer role.

In a separate interview, Jack also mentioned that he felt comfortable "launching the theory" behind the concepts needed for a lab or other hands-on activities. Because Jack had had many of the same students in his introductory physics class the previous semester, he also felt comfortable deciding which topics he needed to explain or clarify for the students:

> I had already had them in Physics I, so I had an idea what they knew theoretically in physics class, so that's why I felt comfortable launching a lot of the theory myself that was related to what they just did. (Jack, interview transcription, 2/12/04)

Unlike Ian, Jack could use his knowledge of the students and their experiences in the previous physics course as a resource. In many cases, he used this

knowledge as a basis from which to lecture or explain a theoretical idea to the whole class.

Jack's penchant for an organized, time-efficient class was also noticeable in the video data. For instance, about ten minutes into one class period, Jack walked quickly around the room glancing at student work. Then, he looked at his watch and immediately appeared perturbed. He exclaimed, "Whoa! We need the do now [a warm-up activity in the beginning of class]. I don't see anybody's do now! We're way past time!" At many points during the class period, Ian would walk around slowly, stopping to talk to students for up to several minutes. Conversely, Jack generally walked around quickly and spoke to students for no more than thirty seconds, to answer a specific question. Ian described this as a difference in personality between Jack and him:

> Our personalities are just different. He would just get very tense about things sometimes. So then I would sort of just be like all right. You know. And it wasn't like he was mad—it wasn't anything between him and I, but you know class is starting and he wants to get started—it's just these little give and takes, you know. (Ian, interview transcription, 1/21/04)

Whereas Ian was more passive in letting the class unfold naturally, Jack was concerned with keeping the activities organized throughout the period. At many points, Jack would refocus the students and encourage them to finish up and activity if he felt it had been going on too long, which was illustrated in the description above. Ian, on the other hand, was less concerned with the amount of time spent on an activity if he felt the students were on-task and engaged.

> Ian: Jack and I were a good pairing because we were able to get along personally without openly agreeing on every aspect of the class. Jack took more of the lecturing role with time management and such, whereas I was more passive and eager to help students at any moment. Despite these different approaches we melded together well and freely criticized our own teaching. Working with Jack allowed me to work with someone who, while committed to an organized and efficient classroom, shared my passion for experimentation. Jack taught me there could be a balance between order and student freedom. In addition, Jack taught me to seek out all those untapped resources on the Internet and in publications. He would often arrive for the day with news of a new web site we should use or discussion topic for the class.

It is important to note that contradictions also emerged within these patterned roles; we saw examples in which Ian took the role as lecturer and Jack took a more peripheral role. In the section that follows, we discuss Ian's practices in the division of labor during coteaching and elaborate on the roles that he took most often. In essence, the patterns that emerged in Jack and Ian's coteaching arrangement show that each teacher preferred different roles and practices. Although these roles were different, they were complementary and led to a successful coteaching partnership.

Ian's roles and practices

Throughout his experiences in the engineering physics class, Ian put most of his effort into building trusting relationships with the students that he could use later for exchange value, for instance, to get students to actively participate in learning activities. Ian claimed that building interpersonal networks or social capital with students was stressed in his science methods course, and he immediately saw it as one of the most important concepts to be utilized in the classroom. In viewing the classroom tapes longitudinally, it was evident that Ian's interactions were students were friendly and positive. He would often talk to them informally about topics unrelated to class. The students trusted him with important and personal information; for example, Ian told the story of a student that came to him because another student wanted to fight him after school. Ian was able to mediate in the situation and talk to the vice principal, which enabled the young man to avoid the fight.

According to Ian, getting to know the students was one of his top priorities. Because of the structure of their coteaching arrangement, he was able to spend more time doing this.

Ian: It was like, I wanted to do certain things, and Jack wanted to do certain things, but since we were both there, it was easier for us to do those because the other person was always handling the other things. You know what I mean?

Beth: What do you mean? You wanted to do other things, like an activity?

Ian: Yeah, like, or even like more specific like, let's say that Jack's doing something at the board, and then I want to talk to some of the kids, I want to try and build personal relationships with the kids, right, that's one of my goals, so I have that time to talk to all the kids while he's doing something. And the rest of them are all doing it with him, and I can talk↑ specifically to someone, whatever. So, he's affording me time to do that.
(Ian, interview transcription, 1/21/03)

Figure 2.3. Ian (left) works with a student at the board in the engineering physics class.

Ian's attempt to forge personal relationships with the students was evident within the video data as well. At one point during a lesson in which the students worked in collaborative groups on a set of physics problems, he spent eleven minutes chatting with a particular group. During another lesson, Ian spent several minutes helping a student work through a problem at the board. Rather than inviting the entire class to get involved in this "teaching moment," Ian focused solely on this particular individual and helped her work through the problem.

I would rather explain something five times to each group individually than two or three times to the whole class. My whole method of teaching relies on personal relationships and without those I am sunk. Just like in an emergency you have to point to one specific person and say, call 9-1-1, otherwise everyone will just stand there. (Ian, interview transcription, 1/21/03)

Another role that Ian took on throughout his coteaching partnership with Jack is that of the creative force behind many of the hands-on activities. Ian enjoyed creating constructivist, hands-on activities in which students would have the opportunity to actively explore different physics concepts.

Ian: Really, eighty percent of the activities we did, or maybe more, I came up with.
Beth: Okay. The stuff where the kids are working and it's not up at the board.
Ian: Yeah. And then like, the technology stuff, or the like movies or whatever, that was always Jack.

Beth: Like movies to show the kids?

Ian: Yeah. Or like, yeah, he would find physics stuff on the Internet and show that. He'd always have that stuff. I don't know. It just worked well because we were better at different things.
(Ian, interview transcription, 1/21/03)

Because of Ian's creativity and interest in thinking up such activities, he took the responsibility for planning and enacting them throughout the engineering physics course. Jack also attested to Ian's creativity in crafting hands-on activities. "He had more an intuitive sense to write up these fifteen minute mini-labs we called them, so he wrote up more of those than me" (Jack, interview transcription, 2/12/04).

Both coteachers clearly acknowledged each other's strengths and the practices that allowed them maximum comfort. Ian claimed that in many ways their arrangement was an ideal pairing because of their different interests and willingness to work collaboratively throughout the coteaching process. In exploring their arrangement and their individual and collective agency within structures that unfolded, we found that the division of labor for this particular pairing allowed each coteacher the power to accomplish his particular goals. Additionally, the students also benefited from their coteaching as were exposed to different types of teaching between Jack and Ian. Because of their different approaches to teaching the content, the students had multiple opportunities to grasp the concepts.

Becoming collaborators

While coteaching, Jack and Ian had opportunities to negotiate ideas for the class at many points. In this section, we describe the opportunities in which Ian and Jack developed collaborative practices that resulted in shared responsibility and reflection throughout their beginning teaching experience. This primarily took place during their collaborative lesson planning sessions before the class, period, in huddles, or impromptu meetings between coparticipants that occurred during class time, in informal post-lesson debriefing sessions, and in both formal and informal cogenerative dialogues. Each of these practices was an important aspect of Ian and Jack's induction into teaching. In chapters that follow we continually explore the extent to which Ian was able to draw on such practices outside of the coteaching field, amidst much different structures.

Collaborative planning

Several studies have cited the emergence of and necessity for coplanning in conjunction with coteaching (Eick et al., 2003; Gallo-Fox et al., 2005). During coplanning, coteachers have the opportunity to reflect on previous lessons and negotiate the use of activities. They also can decide who might take the lead on an activity or lesson, perhaps by giving directions for a lab, taking the central role during a demonstration, or giving notes using a PowerPoint presentation. Coplanning is one of the core elements in coteaching; coteachers who neglect to coplan or who coplan ineffectively often experience difficulty in enacting organized, well-coordinated lessons. Ongoing reflection and opportunities for learning more about pedagogy are also important aspects of coplanning and coteaching.

> While engaging in a joint effort to prepare for the daily activities of the classroom, teachers actively engage in discussion of student learning and evaluation of their own practices. In ideal situations, these reflective coplanning discussions would serve as conduits to the development of local theories and strategies of action to improve learning but also the development of teachers' pedagogical content knowledge. Teachers would gain insight into the curriculum through the eyes of others engaged in the same context, have their approaches critiqued in supportive communities, and continue along a path of lifelong learning. (McVay, 2004, pp. 23–24)

Ian and Jack's engineering physics class did not begin until early afternoon after most students in their small learning community had eaten lunch. Even though Ian taught a math class at a nearby elementary and middle (grades K–8) school during the early morning hours, he made it a point to get to City High School and meet with Jack daily to talk about their plans for the class. In addition to planning before the lesson, the twosome also took part in postclass discussions to plan subsequent lessons.

Sometimes, Jack and Ian's coplanning was a means to fine-tune aspects of a lesson that one of them had created individually. Usually, one of the coteachers generated an idea for an activity or part of a lesson. For instance, Ian often created lesson plans for some of the hands-on physics activities on his own. The next day, he and Jack would discuss the idea and design other complementary activities for the period.

The following dialogue took place during one of their coplanning sessions and began with an exchange about the logistics of the "egg drop activity," a minilab that Ian and Jack had created. During this exchange, Jack sought to

clarify the directions for the lab activity and give the students clear expectations as to how their performance (doing the activity) would be assessed.

Jack: We can add on or have the whole class performance. (Note: Jack is talking about adapting the group work rubric.)
Ian: Oh yeah. Okay, you can write on there if you want to.
Jack: What do you see as the physics behind this (the egg drop activity)?
Ian: Free fall, kinetic energy . . .
Jack: What about momentum?
Ian: We can talk about momentum but I don't think–
Jack: I think we need to make it very crystal clear as far as what it means. What if the shell cracks but it doesn't come out?
Ian: Okay. No damage. No hairline fractures.
Jack: That kind of limits the uh . . .
Ian: I don't know how you want to do it.
Jack: It limits repetitions of trials because if it hairline cracks the first trial-
Ian: No seepage?
Jack: ((*Laughs*)) Seepage?
Ian: No leaks–
Jack: No fluids.
Jack: They could do frequency with this. ((*Holds up the bicycle tire*)) Are we going to do presentations today?
Ian: I say just have them do it (science in the news) individually today.
Jack: Trade with someone else. Answer five; create five.
Ian: How will they answer five?
Jack: Trade with someone else.
Ian: So they read four?
Jack: Just start today reading.
Ian: ((*Ian looks unhappy. Ian walks away to talk briefly to another teacher, Jack rewrites Ian's directions on the board.*)) Okay, just finish my work for me.
Jack: This is coteaching! So you want to give them a grade for their questions and answers? ((*Erases the whole science in the news assignment explanation and begins to rewrite it. Ian begins to write the "Do now" on the board.))*
Jack: Ah! Peer assessment! The person who created the questions can grade the answers. Do you know how many forms of assessment we have in this one class?
(Debriefing session, video transcription, 2/20/03)

In this coplanning discussion, the coteachers were able to negotiate the activities for the lesson and discuss the means by which the students would be

assessed. Since Ian had established the procedures for the egg drop lab, Jack wanted to know what Ian considered to be the central physics topics to be addressed as a result of the activity. Although Ian had created a rubric initially with specific criteria that would be used in this performance-based assessment, Jack felt comfortable contributing to Ian's work by adding a criterion for the "whole class performance." They were also able to negotiate their expectations for the egg's condition after the drop—their discussion included an exchange about the possibility of fluids emerging from the egg as a result of small cracks. In addition to the discussion about the egg drop lab, which was the central activity for the lesson, they also had an opportunity to discuss how the students would proceed with the "science in the news" activity.

Interestingly, traces of the division of labor discussed previously are also evident in this vignette. Jack took the role of "organizer" when he stated that they should "make it very crystal clear as far as what it means [the criteria for a successful egg drop project]." Ian was the creative force behind the egg drop activity, however Jack asked for clarification of the physics concepts to be targeted ("What do you see is the physics behind this [the egg drop activity]?").

Additionally, there were three instances in the above text in which Jack truncated Ian's agency by changing Ian's original plan or redoing work that Ian had done. Although Jack's actions were most likely unconscious, they denote an unequal distribution of power in this particular coplanning session. Rather than a negotiation of ideas for the lesson, upon closer inspection there were several instances in which Ian was disempowered. For example, in the first line of the vignette, Jack took the rubric Ian had created and began to write on it. In turn, Ian sarcastically said "Okay, you can write on there if you want to." Although Ian was not adverse to Jack adding his perspective to the assessment tool and welcomed his perspective, this showed Jack's comfort in taking control within the coplanning session.

Ian also suggested that the students do their science in the news activity independently. Alternately, Jack proposed that the students write questions, trade with partners and then answer their partners' questions. In this situation, Jack once again had the final say. He even went as far as erasing Ian's directions on the board for the activity and rewriting them when Ian walked away for a moment. Ian's disappointment with the situation was evident when he said, "Okay, just finish my work for me." Jack's response ("This is coteaching!"), however, suggests the humor and playfulness in their coteaching relationship and Ian's comfort with Jack's penchant for taking control in such situations.

Post-lesson debriefing sessions also took place regularly between Ian and Jack. According to Roth (1998), debriefing sessions that take place informally

between coteachers or other coparticipants after the close of a lesson can also lead to greater understandings about classroom events and possibilities for future actions. He argues that these moments can be used to make explicit the events and practices that often go unarticulated. In this professional discourse, teachers coconstruct their own interpretations of the analyses stemming from the classroom events.

After one lesson during which they split the class into two groups, Jack and Ian had the opportunity to discuss one particular student's comprehension of a concept:

Jack:	I think they got it, theory versus actuality.
Ian:	Yeah, they had problems with that too. Derek said the numbers weren't working out (for the Hookes' Law lab).
Jack:	The scale isn't that accurate. I don't think I do a good enough job of pointing out sources of error. Was he (Derek) frustrated today?
Ian:	No, it was my fault—I wasn't explaining it well. It was my fault. (Debriefing session, video transcription, 2/28/03)

In this discussion, the coteachers were able to discuss concepts that the students may not have comprehended fully as well as their own practices, which may have contributed to the students' frustration. The session was an opportunity for the coteachers to reflect on the events of the class and elucidate issues, such as their explanation of "sources of error," that could be revised and expounded upon in future lessons.

Essentially, through coplanning and debriefing sessions, Ian and Jack were able to discuss the lab activity and other activities that would be structured into the lesson such as the science in the news questions and the "do now" activity. Although the series of interactions in the coplanning vignette suggests a power differential, both Jack and Ian reported that overall they were quite happy with their coteaching pairing and the teaching that ensued from their collaboration.

> Although Jack took the more traditional role of the lecturer I felt comfortable in my role of the facilitator. I don't know how the students viewed us but I felt as though they looked at us both as equals and respected our authority. (Ian, interview transcription, 1/20/04)

Thus, Ian felt that any issues resulting from the power imbalance were offset by their trusting relationship and shared responsibility for all aspects of the engineering physics classroom.

Huddles for in the moment collaboration

Coteachers regularly engage in "huddles," which serve the purpose of "touching base and fine tuning a lesson, reaching agreement on what to do next and identifying and securing the resources needed to meet agreed upon goals" (Tobin et al., 2003, p. 53). In the case of the engineering physics class, huddle involved varied stakeholders in the class including Ian, Jack, Mister Springer (the cooperating teacher), Siobhan (a graduate student and participant observer), Sonya (the student teaching supervisor), and Ken (the methods instructor), among other class participants. During an average class period, the participants huddled approximately ten times—each huddle lasted between fifteen seconds and three minutes.

Most times, Jack and Ian would huddle to talk about the practical aspects of the class when the students were busy working on individual or group activities. The following breakdown gives an example of the huddles that occurred during one period in which the students were working on the egg drop activity:

Huddle 1: Ian mentions to Jack that he is standing in front of the board, blocking the view of some of the students.
Huddle 2: Mister Price approaches Jack to discuss with him the necessary procedures that must be followed in order to obtain the license for the Lego Robotic Kit software.
Huddle 3: Jack checks in with Ian, deciding what to do next.
Huddle 4: Jack asks Ian if they are going to assign groups for today's work. Ian responds, "No." and then instructs the students to divide themselves into groups of four for the class.
Huddle 5: While Jack was presenting concepts in the lecture portion of the class, the resource room teacher entered the room wishing to talk with the teacher about a specific student. Mister Price fields her questions and then in this huddle, describes the conversation to Jack and suggests that he follow up with the resource teacher.
Huddle 6: Jack approaches Ian to ask about the groups he has been observing. He asks who has been doing the most of the work. He then asks Ian how long he thinks the students should have to work on the lab activity.
Huddle 7: Ian tells Jack, "I can go between these two groups if you want to stay with that one over there." Jack says, " I like how the group work thing worked out."
Ian replies, "Yeah, it was good."
Huddle 8: Jack addresses Ian, "We're not gonna have time to finish. Should we work on it tomorrow?" Ian says, "Yeah, I guess what about stage 3 – finish that tomorrow too?"
Huddle 9: Ian talks with Jack and then goes over to check how Jack's group is doing on the lab.

Huddle 10: End of class huddle, "What are we doing with these worksheets? Homework. Questions tonight for homework?"
(Video and audio transcription, 3/6/03)

The data within these rich descriptions show that over the course of one 96-minute class period, numerous negotiations occurred between the coparticipants. Jack, Ian, and Mister Springer were able to discuss the class procedures (H3), ways of grouping students (H4), particular issues with a special education student (H5), the amount of time needed for an activity (H6), the evaluation of an activity (H7), and an appropriate time frame for continuing the activity (H8, H10). Each of the elements discussed would have occurred implicitly in a classroom taught by one individual, yet in the coteaching arrangement, Jack, Ian, and Mister Springer were able to negotiate decisions to be made *while* the lesson was being enacted.

The interactions in the huddles above illustrate moments in which the pedagogical or practical decision-making for the lesson's flow became a collaborative activity. The emergence of huddles show that as beginning teachers, Ian and Jack's agency was expanded because of the structure of coteaching. During the lesson, they were able to use each other (and the other stakeholders) as resources to adjust procedures, discuss particular students or evaluate aspects of the lesson. Jack and Ian's huddles were also a way for them to reflect on the unconscious or unintentional aspects of their lesson plans—to discuss and make decisions about the more practical, procedural or emerging facets of the lesson that they may not discussed formally coplanning sessions. Ian and Jack's agency insofar as their capacity to access one another during the enactment of the lesson is a highly important implication for coteaching as a model for student teaching.

> Ian: Huddles during class allowed Jack, Mister Springer and I to express our own evaluations of the class instantaneously and make necessary changes. There were aspects of the class I would never have noticed if they had not been brought to my attention during the huddles. Even small details, like when to end an activity, could be negotiated. For me, as a new teacher, it was very encouraging to have partners who would back your decisions and actions. Also, huddles enabled us to fact check the specifics of the lesson. For instance, if Jack and I weren't sure of the reason for a machine's design we could quickly double check with Mister Springer. However, huddles were more than a safety net; by verbalizing our thoughts and decisions, we took responsibility for those actions. Similar to the cogenerative dialogue, the act of huddling implies discussion and agreement on the next series of actions, thus there can be no reasonable ignorance of the decision process.

Cogenerative dialogues

One of the more formal ways in which Ian and Jack collaborated to enhance their teaching and the students' learning was through cogenerative dialogues. Throughout their science methods course, Jack and Ian were encouraged to use cogenerative dialogues. In an effort to maximize the input of varied perspectives, cogenerative dialogues were conceptualized as a means to "promote the emergence of cogenerated understandings and collective responsibilities for agreed upon decisions about roles and insights into possible ways to distribute power and accountability" in a given field, for instance, the classroom or the curriculum development space (LaVan & Beers, 2005).

> The power of this type of dialogue also lies in the opportunity for participants to identify and review practices that are unintended and habitual, while discussing the power relationships, roles, and agency of all of the stakeholders. The associated redistribution of power (vertically and horizontally) allows all stakeholders to discuss future actions and activities as well as aid in planning for improvements to the quality of teaching and learning. (p. 149)

Ian and Jack saw cogenerative dialogues as a means of both initiating collaborative inquiry into their teaching practices and fostering a community of learners in which all participants held responsibility for action. After Ian and Jack had been coteaching the engineering physics course for about a month, they decided to invite their students to participate in a cogenerative dialogue during lunch, which happened to take place immediately before their class period. Because the cogenerative dialogue took place before the day's lesson was enacted, Jack and Ian took the opportunity to discuss the general class structures. Ian described the session as follows:

> The purpose of this discussion was to include the students in the design of the class, give Jack and I a chance to explain some reasons for the way the class was run, allow the students to voice their opinions about the class, to give us a chance to hear what the students thought about physics in general, and finally to allow the class to form an atmosphere of shared responsibility. Jack and I reviewed the discussion and as a result of it and ones like it certain aspects of our class were altered and we too altered our own teaching methods to some degree. The discussion was full of insights that I would not have been aware of otherwise. For example many of the students realized that physics is needed for their everyday life and for their potential college future. One aspect of the discussion that needed to be improved was that some answers the students gave were generic; this led me to reevaluate the size of the group used. Ultimately I think it is best to use groups of varying size over the term of the course. (Ian, Master's portfolio essay, 2003)

Figure 2.4. A cogenerative dialogue in Ian (far left) and Jack's (not pictured) engineering neering physics class

During one cogenerative dialogue, Ian and Jack inquired about numerous aspects of the class, including the students' conceptions of a science class, Jack and Ian's roles as teachers, the purpose and efficacy of group work and class discussions, the relevance of physics in the students' daily lives, the steps involved in applying for college, and the importance of the students' suggestions for the class. Even though the group involved in the cogenerative dialogue was larger than expected (Figure 2.4), several salient issues were brought to the table, some of which became starting points for changes in the class structure. One concrete outcome from the dialogue that emerged from the students was an innovative class activity.

Sierra:	With the suggestions, whatever, I think y'all put into mind our concerns and stuff like that, but it just takes time for y'all to get to them. Cause I still have my concerns up there ((*She points to the "concerns" section of the board*)) and I know it takes time, and um, and that's what I think. It takes time.
Male student:	Which one you wrote?
Sierra:	To have skits.
Student:	Oh that say skits?
Sierra:	((*Everyone laughs*)) What say, oh you thought it said something else?
Male student:	I thought it said shirts.
Jack:	I like that one

Ian: What does everyone else think about that?
Female student: Yeah I would love that. ((*Everyone talks*))
Male student: Make our own plays up about physics. That'd be hot. ((*Everyone talks*))
Sierra: If we put our minds together we could come up with something powerful.
Jack: I think, I've never done it before in a science class, so I've, I've kind of, I'd have to have a lot of time to think about it, but maybe our approach should be, let you guys, let's brainstorm with you guys about this activity. Let's structure it together.
Female student: I think that would be interesting.
(Cogenerative dialogue, video transcription, 2/27/03)

This particular vignette within the cogenerative dialogue gave several members of the class community an impetus for responsibility. With Sierra's suggestion and positive responses from other members of the group, Jack and Ian decided to incorporate skits into the class and use the students' help to give structure to the activity. Even though Sierra had written her suggestion on the concerns board, the cogenerative dialogue became an important field for the participants to talk about its incorporation into the class activities. It also gave other students the opportunity to voice their comments and to collectively negotiate the implementation of the activity. Through this collective negotiation, the participants discovered a way to transform the structure of the class (creating skits) that would allow for the students' agency to unfold and thus foster enhanced, creative learning experiences through performance-based assessments.

At another point during the cogenerative dialogue, the coteachers were able to ask questions that would index the relevance of the class content in their everyday lives. This served not only as a means for Jack to gauge the students' perceptions about the value of physics, it also showed that the students could comfortably and appropriately apply the concepts they were learning to other contexts. Earlier in this vignette, Jack posed a question regarding physics' relevance in their daily lives:

Brad: I feel as though, cause, I caught myself starting to relate uh, physics to like, stuff I do.
Jack: ((*Smiles and stands up*)) Oh my gosh. ((*Walks toward Brad*))
Brad: I was on the trolley, right, and I was goin' downtown, right, and the trolley was packed so I had to stand up. So, my mom came down from the bus, but we all had to stand up, so uh, so uh, I was like mom, watch, watch we all gonna jerk back cause, uh, cause the inertia. And she was like, "what's that?" ((*Everyone laughs*)) And then I start tellin' her what it was, and she was like, "Oh".
Ian: Well that's good, Brad.

Jack: ((*Smiling*)) Warms our hearts.
Ian: I can sleep at night.
(Cogenerative dialogue, video transcription, 2/27/03)

The excitement shared by the two teachers is obvious in their humorous reactions to Brad's story. In this case, Jack and Ian used cogenerative dialogue to assess student learning—their ability to apply the concepts they had discussed in class to other contexts. Their informal nature of the dialogue encouraged students to discuss their ideas and perspectives with little pressure or anxiety. As Brad discussed the concept of inertia in ways that were relevant to his life, Ian and Jack could assess his understanding of the concept in a nonthreatening and low-anxiety way. After the cogenerative dialogue, Jack and Ian could use the informal data they had collected about the students' thoughts and perspectives to inform planning and teaching.

Although Ian and Jack's use of cogenerative dialogue was fruitful for student assessment and for expanding their repertoire of pedagogical tools, one contradiction emerged with regard to the element of shared responsibility. Although one of the outcomes of cogenerative dialogues should be an increased sense of shared responsibility for all of the stakeholders involved, this was not necessarily the case in Ian and Jack's engineering physics class. Since most of the dialogue centered on Ian and Jack's actions in the classroom, the group did not figure out ways in which they could help to restructure the environment for their own good; rather, most of the talk focused on how Ian and Jack themselves could change the classroom structure. Thus, the students had little responsibility for change upon leaving the confines of the cogenerative dialogue since most of the changes were geared toward Ian and Jack. Even though the coteachers received valuable insights into issues that iterate the students' individual and collective concerns, their cogenerative dialogues did not foster a redistribution of power within the classroom. The plans and responsibilities cogenerated by the group were relegated to those who typically hold power in the classroom—the teachers. Regardless, cogenerative dialogue was an effective means for Jack and Ian to collaboratively investigate the classroom dynamics and foster students' agency so that they could help to restructure the environment for the better.

Moving beyond coteaching

As a result of coteaching, Ian's student teaching experience was unlike those experienced by many other students in more traditional teacher education programs. Integral to his experience were the numerous opportunities he had to

work collaboratively with Jack to explore, refine, reflect on, and transform his own teaching.

The value of Ian's coteaching experience in general is reflected in an essay from his Masters portfolio, a capstone assignment that showcased artifacts that Ian collected during his student teaching experience.

> As student teachers we need to be brought into the job in a practical, experiential manner. Teaching is something you can read about your whole life and still have little clue how you will feel the first time you stand up to talk to the class. Coteaching has worked very well for me and has led me to reevaluate the role of the teacher in the classroom to some degree. Coteaching allowed me to observe more of the classroom environment and understand better why some students perform poorly. Coteaching also made me aware of how much I might miss if I were the only teacher, therefore it has helped me not only in the sense of preparing me for traditional single teaching but also has made me aware of aspects I would have missed otherwise. (Master's portfolio essay, 2003)

After finishing his student teaching experience, Ian was able to critically consider the way in which coteaching prepared him for his role as an autonomous teacher. He emerged from the teacher education program with a keen sense of the power of reflection, collaboration, and the benefits of conducting teacher research on an informal basis. In the statement above, Ian mentions two specific understandings he came to during his student teaching experience. First, Ian indicates that his beliefs about teaching had evolved as a result of his coteaching experience. For instance, he mentions the disparity between his idealism and about teaching and the reality of the classroom. As a result of coteaching, Ian experienced the unfolding and sometimes overwhelming structures of the classroom with a peer, which served as an element of support for him as a beginning teacher.

Second, Ian recognized the benefits of being a reflective observer of the unfolding events of the classroom. Because of Jack's support, he was able to better understand students' needs and evaluate teaching decisions accordingly. Ian's capacity to talk to students extensively during class time was supported by the structures within coteaching; from these conversations Ian was then able to reach understandings about students' needs (i.e., "why some students perform poorly").

The practices Ian developed during the coteaching experience (the first field of analysis in this volume) became foundational aspects of his teaching in subsequent fields, even though the structures he encountered in subsequent contexts were radically different. In the next chapter, we describe the summer curriculum development project in which Ian gained teaching experience and was able to

further explore the benefits of building relationships with students—a goal that he had initiated during his student teaching. We consider Ian's experience in the summer curriculum project as a field that serves as a site for further collaborative research on his teaching practices and as a major transition point between his teacher education program and his first year teaching experience.

We conclude with a reflective teaching poem that Ian wrote during his student teaching. Within the poem, several aspects of Ian's teaching philosophy and his experiences at City High School are apparent.

One day at a time

We ask so much of them,
Sit still,
Look here, Care.
We forget how it was for us,
And why it isn't like that today.
We forget they are not us
And are doing all this for the first time.
What do we really want?
When would we be satisfied?
Is it right to be satisfied?
What do they see,
When we stand there?
What do we see,
When we look out from there?
Sometimes only what we want to see.
We spend our time alone,
Thinking,
"How could we change them?"
Instead of thinking,
"How can we keep them the same?"
(Ian, reflective teaching poem, 3/7/03)

3 The summer curriculum project

One of the ways that Ian sought to change his role as a teacher was by restructuring the classroom to better suit his students' needs and interests. As we detailed in chapter two, Ian began to restructure the engineering physics classroom primarily by listening to students, building trusting, respectful relationships, and by infusing the curriculum with project-based, hands-on learning opportunities. Throughout his student teaching experience, Ian continued to reflect on the notion of respect and the ways his students at City High were often disrespected at school. The following narrative illuminates the connections between respect and his role as a teacher:

> Throughout my time as a student teacher I have learned that I can be a teacher and make a difference. I started out simply wanting to help students learn and I have learned that I can do so much more than that. In all the classes I worked with the biggest issue I felt needed attention was respect—respect between the students and the teacher, between the students themselves, and between the teacher and the students. I saw a variety of teacher strategies in dealing with this issue. I saw teachers who simply insisted on certain behavior with immediate consequences. I saw teachers who ignored the issue all together. And I saw teachers attempt to work with the students to raise the bar for everyone. For myself personally, respect is the most important issue in the classroom. If the students feel like a certain behavior is expected of them and that they are part of the class, they will live up to those standards. It has been my goal to explain to my students logically why I want them to behave in a respectful way. I also have talked with them about what their own opinions of respect are. Throughout the year I feel I improved respect in the classroom a great deal, and that I have a good idea of how to become more effective from the beginning. (Master's Portfolio, Self-Evaluation, 2003)

By the end of Ian's student teaching experience at City High, he had begun to solidify some of his foundational beliefs about teaching and what it means to be an urban teacher. The reflection above emphasizes the centrality of mutual respect in his teaching; Ian realized that in order to be an effective urban educator, his practices had to support the notion of respect.

A few weeks before graduating from his teacher education program, Ian was invited to participate in a summer project that would foster even further reflection on the importance of respect in his classroom. Because of his certification in physics and background in engineering, Ian's science methods professor asked him to participate in a grant-funded project. The goal of the project was to enlist a small group of science teachers, university researchers, and four students from City High School to work together to design several units of standards-based, culturally relevant science curricula.

Ian's involvement in the summer curriculum project, a second field of analysis, was a pivotal experience in his development as an urban science and math teacher. Throughout the project, Ian had the opportunity to further reflect on the notions of respect and capital and consider the challenges and implications of creating culturally relevant, student-centered curriculum with students. In this chapter, we discuss the findings of the project itself through the theoretical lens we presented in chapter one. Additionally, we explore the understandings Ian gained throughout the process about urban teaching, agency, student voice, and culturally relevant pedagogy.

The background for the project

The summer curriculum project sought to empower a group of marginalized, urban students by encouraging student participation in the curriculum development process. The overarching goals of the project were threefold: to give students voice and help them to become members of the school community (Shields, 2000), to create meaningful, engaging curricula that would create bridges between students and teachers (Davidson, 1999) and to allow students to actively construct meanings in the curriculum's targeted content, thereby increasing their knowledge of select science concepts.

Given the academic distress typically attributed to urban schools, an important consideration was making the curriculum more relevant to the student population. Thus, attention was given to the mismatch between mainstream Eurocentric curricula and both an African American cultural ethos (Boykin, 1986) and culturally relevant pedagogy. Essentially, this project challenged the assumption that science curriculum can be consistently effective for all student populations. Moreover, we hoped to make the curriculum relevant and meaningful by incorporating the perspectives of several students.

The creation of science units was not the only goal for the project. From a research standpoint, we also wanted to investigate what it means to involve urban students as curriculum developers—how could we foster student voice and

agency, especially when working with students who have historically been marginalized? Additionally, we hoped to explore the teacher learning that would occur during the eight-week project. What would Ian learn throughout the process?

Ken Tobin, the principal investigator for grant, initiated the idea for the summer curriculum development project. Rather than starting from scratch, he wanted the group to begin with a set of units that were originally created for use in the Detroit middle schools by The Center for Learning Technologies in Urban Schools. Each standards-based unit was originally designed around driving questions. They also included many hands-on activities and integrated technology, which Ken hoped to retain in the final product. Essentially, the project group would work together to make the activities within the unit more relevant to the interests and backgrounds of the students involved. Additionally, they would adapt the context of the units to a Philadelphia context since the original units utilized local description and photographs that were relevant to the Detroit, Michigan area.

Ian and the other teacher researchers played various roles throughout the project. They were expected to serve as pedagogical experts, to help the students interpret the new science concepts, to accomplish the organizational tasks of rewriting the curriculum, and finally to observe, reflect upon, and discuss the process behind building the curriculum. The research team, consisting of the four teacher researchers and four student researchers, met twenty hours a week for eight weeks to work on the development of three science units. The topics for the units included air quality, communicable diseases, and the physics of machines. Before the inception of the project, each of the teacher researchers read and printed the original curriculum from the Internet. They also used the original units as a resource throughout the project.

Theoretical framework

Consistent with the previous chapters, we use the constructs of structure, agency, field, and the forms of capital as lenses through which to view the events of the summer curriculum development project. Primarily, we return to the concept of agency to explore how the participants involved in the project accessed and appropriated resources to create engaging, appropriate curriculum. Because of students' historically limited roles in creating or even giving feedback on curriculum, student voice was a central aspect of the project.

Since individuals employ agency, or the power to act, when they interact with structures, it was also essential to consider the structures that unfolded in

the curriculum project field. Would any of the structures within the project support the students' power to act and their capacity to contribute in meaningful ways? This was particularly important for the teachers' learning throughout the project. Ian and the other teachers would hopefully have opportunities make connections between the structures in the project that might support or constrain student agency and voice with the structures of their classrooms, and in schools on a more macrolevel.

Although the curriculum work took place in a field that was highly distinct from that of the classroom insofar as the individuals, the time, the physical setting and the activity, we were interested in whether the students and researchers would utilize practices similar to those they used in schools. Thus, would the participants utilize any of the figurative "tools" or culturally, historically, and socially mediated practices from their cultural toolkits (Swidler, 1986) as they move into the field delineated by the curriculum project? Because of the porous, loosely bounded nature of fields (Seiler, 2001; Tobin & Carambo, 2004), we anticipated that participants might utilize practices that might normally be used in the classroom setting.

The participants, setting, and context

Even though Ian's experiences serve as the main context for study, the summer curriculum project was a collective endeavor modeled after a learning community (Roth, 1998; Putnam & Burke, 2004). Consequently, scenarios in which other teacher researchers or students played the lead role were nevertheless opportunities for new understandings to emerge. Aside from us (Ian and Beth), several other participants were involved in the summer work. Four student researchers, Linda, Ivory, May, and Shakeem, were part of the team. Ivory, May, and Shakeem had just finished the eleventh grade at City High School and had worked with the Discovering Urban Science (DUS) Research Group for two previous summers on other projects dealing with urban science education. Linda had just graduated from City High and was beginning her first summer as a student researcher with DUS. For this particular project, each of the students worked twenty hours per week at a rate of $7.50 per hour for eight weeks. In addition to Ian and me, two teacher researchers (Jen and Cassondra) worked on the project. More detailed descriptions of participants are given below.

The teacher researchers: Jen, Cassondra, Beth, and Ian

In the developmental stages of the project, Ken decided that he would invite the same student researchers to participate that had been involved with DUS during

the previous summer. Additionally, he wanted to have several facilitators to work with the students, mostly to serve as the content expert for each of the units. Because of Ian's experience in the engineering physics course, Ken asked Ian to work with the students on the physics of machines unit, which focused on the topics of force, motion, simple machines, and distance. The curriculum was framed by the question "How can I use machines to help me build big things?" Since the physics unit was the shortest unit, Ian worked with the students only one day a week during the project, on Fridays. In addition to the eight required meeting times, Ian came in three or four extra days during the summer to help out in other capacities.

Jen, a twenty-eight-year-old White female, worked with the students twice a week on the communicable diseases unit. She had just completed her second year of teaching biology at an urban charter school in Philadelphia. Her unit focused on the biology of disease, how diseases spread, and how our bodies fight them. It addressed the question, "Can my friends make me sick?" Jen had graduated from the same teacher education program as Ian and had worked with Ken on other research projects. She was excited about the possibility of using the products of the curriculum project in her classroom during the following school year. Like Ian, Jen was familiar with the issues specific to City High because she had cotaught biology and physical science there during her teacher preparation. Also, she had actually taught one of the student researchers (Shakeem) during her one of the semesters of her student teaching.

Cassondra, a university researcher with a background in environmental science, led the unit on air quality, which focused on the chemical and physical properties of pollutants. This unit was framed by the question: "What affects the quality of the air in my community?" Although Cassondra had not worked formally as a secondary teacher, she had taught informal environmental science to K–12 students. Also, Cassondra had become familiar with many of the issues and challenges at City High in her work as a doctoral student and as a research assistant during the previous year.

Beth served as a participant observer and helped each of the teacher researchers at varied points. Although she was an experienced foreign language teacher and doctoral student in teaching, learning, and curriculum, she had only a basic background in science. More often than not, she observed or videotaped the lessons and helped both students and teachers with activities when needed. Beth was present every day during the summer curriculum project.

The student researchers

Ivory, a seventeen-year-old junior at City High generally showed up daily in long jean shorts and extra-large-sized white T-shirt, both of which fit loosely on her short, slim frame. She always kept her hair in braids and generally avoided wearing makeup. Ivory's life seemed to revolve around two things: rap and basketball. She often wore an airbrushed T-shirt that displayed her rapper identity "I.V. Fabulous" or a picture of a basketball hoop and her jersey number from City High School's varsity girls' basketball team. It was clear that Ivory worked extremely hard to excel at rap and basketball—areas that were typically male-dominated. As the only female adolescent on her block, Ivory claimed that she learned to "play ball like men do" (Ivory, interview transcription, 7/12/02). Ivory's self-confidence and motivation was evident in her description of herself:

> I would describe myself–talented, smart, hardworking … I got talent in mostly anything. I got talent in playin' instruments. I got talent like in basketball. I got talent in like track, singin', rappin'. I can do basically anything. (Ivory, interview transcription, 7/12/02)

Ivory was known for being a hard worker, and although she was considered at risk because she lacked basic skills in reading, writing, and math. However, she was able to get average to above-average grades at City High due to her motivation and work ethic. During the previous two summers, it became apparent that Ivory was highly motivated to work hard on things that she found interesting. However, she often avoided or complained outwardly about many of the science tasks that were required throughout the curriculum project. During our work together, Ivory often became fixated on certain personal tasks. For instance, she spent the better part of a few days searching online for a new dog to adopt, even though she was not sure that her mother would allow her to have another dog. Ivory's dog search distracted her from her work on the curriculum. Although she was supposed to be working on activities for the air quality unit, she would surf the web until one of the adult researchers pleaded with her to join in on the task at hand.

Shakeem, the only male in the group, had the most in common in the Ivory. The two often discussed rap and basketball. Shakeem, a tall, robust, and generally outspoken African American seventeen-year-old, had failed the junior year because of absenteeism and his lack of motivation in school. To us, Shakeem often seemed to be the sharpest student in the group—when he was interested in the topic or the activity, he would add valuable insights to the task at hand. However, when Shakeem was disinterested in the task, he would shut down,

refuse to talk, sleep in his chair, or like Ivory, he would surf web sites pertaining to rap, sports, or professional wrestling.

Shakeem lived in a small, run-down row home with his mother, stepfather, and younger brother. Like some of the other student researchers, Shakeem contributed to the family's income by giving part of his paycheck to his mother. He spent most of the summer in limbo, not knowing whether or not the family would be moving to Atlantic City, a city in New Jersey about an hour away, where Shakeem had lived as a small child.

Linda, a self-described "teacher's pet," got involved with the DUS research project as a result of her relationship with Sonya, another doctoral student working in the large research group. Linda, a seventeen-year-old African American female, had been in Sonya's science class in seventh-grade and had sustained a relationship with her throughout high school. She spent the first thirteen years of her life in Carbondale, Pennsylvania, a rural, predominantly White, working class town outside of Philadelphia. After moving to Philadelphia, Linda claimed that her relationship with her mother went "straight to hell." Linda mentioned that she relied on her math teacher and Sonya, her middle school science teacher, for help and encouragement, since she received minimal support at home.

When Linda was in eighth grade, her mother decided to move to Philadelphia phia to be closer to family. Lind claimed that this move was the most difficult transition in her life; she was shocked and disappointed by the condition of the schools in the city, the "loud, ignorant, and beyond disrespectful" students, and the lack of rigor she encountered in her classes. She was surprised that the students were far behind her in reading and math. Later in the year, with Sonya's help, Linda skipped the eighth-grade and went straight to ninth-grade at City High School. Although she was disappointed in the school and its students, she was able to separate herself from many of the students by her placement in the school's most academically rigorous small learning community.

Linda was accepted to a state university and counted the days until she could leave her mother and Philadelphia behind. Coming from a single parent, economically disadvantaged family, Linda also worked at a fast food restaurant at night to support herself financially and to save money for college. Throughout the course of the summer project, Linda was quiet and reserved in comparison with the other students. She was also the most motivated and interested in the science concepts. Each day, she brought a book and read during the midmorning break.

Like Linda, May was often reserved during our work on the summer project. May's face always exuded warmth and kindness; she often seemed much older than her seventeen years because of her maturity. Although she looked like

a typical teenager with her braided hair, jeans, flip flops, and brightly colored T-shirts, May was considered by the other students to be an "ol' head," a term usually given to wise, respected members of African American communities. To some extent, she earned this title because of her intelligence and street smarts. However, May was also known for being the nurturing caregiver of the group. In addition to DUS, she worked as a cashier at a small grocery store in her neighborhood and spent most of the rest of her free time taking care of her younger siblings, nieces, and nephews. Because of her childcare responsibilities at home, May often missed school and was having problems academically because of her absenteeism. Although she was considered at risk in school, May had become well known for her interest in writing in her journal and for her wonderful poetry. May was well respected by the other members of the group even though she was generally quiet and introspective.

The history of the research group

The summer curriculum development project was situated within a larger body of research on the teaching and learning of science in urban schools. Headed by Ken Tobin, the research team was made up of many teacher researchers, and graduate students and student researchers. A large focus of the three-year overarching project was empowering marginalized, urban students by involving them in the research, which they participated in during summers or in some cases, after school. Aside from the students from City High described in this chapter, other students from the other four schools that were involved in the study participated in other projects under the grant activity.

Ivory, Shakeem, and May, the students who participated in the summer curriculum project, had taken part in two previous summer projects. During the first summer they focused primarily on a "sounds of the city" project in which Rowhea, another member of the research group, considered ways to make physics more culturally relevant for urban students. The students' work culminated in a movie about sound in the city that they had created by videotaping their neighborhoods and editing the tape with video-editing software. An additional focus during this summer was exploring the students' cultural capital and the practices that either supported or contradicted their capacity to do science.

During the second summer, Melissa, another member of the research group, worked primarily with the students on gender research. Through extensive interviews and other qualitative data sources, Melissa explored what it means to be an African American female adolescent in the inner city through the cases of May and Ivory. Although her focus was on Ivory and May, Shakeem also

participated in the gender exploration activities, which included creating raps and videos about their neighborhoods and other aspects of their life worlds.

The setting for the summer curriculum project

The DUS research office suite served as the setting where the summer curriculum project was carried out. The office was two located two blocks from City High School in a building that was used primarily by a university and a local hospital. The use of the office enabled the student and teacher researchers to participate in discussions and interviews without the interruptions typical in the high school setting. Additionally, the office housed several computers with video-editing capabilities as well as other technology and materials such as tape recorders, photocopiers, video cameras, ample desk space, whiteboards, televisions, and VCRs. All of these materials were used as tools for the curriculum contruction and data analysis.

Ivory, May, and Shakeem, who had worked as student researchers before, were familiar and comfortable with the office space. In the larger of the two rooms, tables lined three sides of the perimeter of the room. On these tables, three computer workstations were set up. Two of the computer stations included video-editing equipment. Shelves with science education journals and other scholarly books lined two of the walls. There were no windows in either of the rooms, which at times made the space oppressive. The center of the room was kept open and free of any furniture. Often times the group met in a circle in the middle of the room or sat on the floor to work on different aspects of the curriculum. The second, smaller room housed two large desks, one computer workstation, a printer, a TV/VCR, a bookshelf, and a file cabinet. The students very rarely accessed the smaller room; instead teacher researchers generally used it to complete other tasks when they were not working with the students.

The evolving structure of the project

Over the course of the summer, the team focused on understanding the students' needs, desires, and motivations in the classroom. The adults continuously encouraged the students to speak candidly about what they would emphasize if they were given free reign to plan and teach a class on each of the topics. However, several contradictions became evident in the initial weeks. In many respects the adults relied on a typical school structure and began to structure the project activities in ways that conflicted with the project's premise of equal voice and authority for all participants.

On many occasions during the first few weeks of the summer, the adults taught a given lesson from the original curriculum and then asked the students for feedback to tailor the lesson. Knowing that the students had not mastered the science concepts, the adults were unable to give students free reign to adapt the curriculum from the beginning. By first teaching the content through mini-lectures or by actually doing some of the hands-on activities included in the original curriculum, the adults felt that the students would begin to understand the science and then would be able to fully participate in the transformation of the curriculum.

The students, however, complained during these early weeks that they were sick of "being in school during the summer." It was difficult for them to become engaged in the topics altogether because of their resonances with the classroom, which was iterated by May in a journal entry: "in the beginning of the summer we found out we were going to be working on air pollution, ethnographies, physics and communicable diseases. Right away I thought about school hearing all the topics" (May, journal entry, 8/21/03).

By the third week, the adults realized that changes had to be made to the structure of the project—they had to relinquish their power in some ways and steer away from the practices they normally utilized in the classroom. The adults would be able to foster the students' participation and capitalize on their involvement by openly changing the structure of the daily routine. After speaking to Ken, the project advisor, the adult researchers met and discussed the logistics of changing the structure of the project. The decision was made that the adults would trust the students to make capable and effective decisions based on their current understanding of the content. If there were points in which they did not understand a particular concept, the adults would be there as guides. One of the ways this could be facilitated was by allowing the students to work with the original curriculum without an introduction by the adults. As a team, adults began to give the students every opportunity to make decisions on their own while guiding them to consider what would be engaging for other students like themselves.

In reviewing the video data, a difference was noticeable in the interactions between the adults and the student researchers over the course of the project. During the first few weeks, it was typical to see Jen, Cassondra, or Ian in a teacher-centered role, teaching a lesson at the whiteboard or involving students in an activity that either came directly from the Letus units or was closely adapted from them. For instance, Ian created a minilab in which the students investigated the application of force to different objects. Through this activity, he hoped that the students would discover how each type of force has an equal

and opposite force. The students had to make predictions about the object receiving the force, manipulate the object, and then write down their observation and an appropriate explanation. During many of these teaching scenarios, the students appeared to be painfully bored by putting their heads down or by avoiding vocal participation. They rarely offered feedback that would actually improve the original curriculum.

During the latter portion of the summer it was typical to see students involved in varied projects according to their interests. Frequently the students had different ideas for engaging activities and worked individually to develop them. For Ian's unit, the students developed several interests that diverged from the original driving question. Yet because of their enthusiasm and the topics' relevance to concepts that would be targeted in any general, high school physics course, Ian let them pursue their investigations. He also helped them to consider ways their ideas could be incorporated into the unit. As the weeks progressed, the students would often ask Ian, Jen, or Cassondra for help if they did not feel confident with a particular concept, or for feedback on an idea for an activity.

We recognized that the field during the first few weeks of the project became structured as a teacher-centered space in which equal voice was *not* afforded to all participants. The student researchers were highly dependent on the adults for direction, which negated the initial purpose of the project. During the latter portion of the project, the adults consciously sought to value the students' interests and their cultural capital by encouraging them to put their ideas and insights into the curriculum.

The following interaction gives insight into the philosophy adopted by the adult researchers during the latter portion of the project. Before this interaction began, Jen had just given the students a few activities from the original curriculum and asked them to change them as they saw fit. This interaction occurred the day after the adults had a formal discussion about the way the project was unfolded. As a result of the discussion, they had decided to consciously alter the daily routine. Immediately before this interaction, Jen had brought a lesson plan and the related materials to the students and asked them to spend the morning thinking about how it could be changed to be more interesting and relevant to them. Since the students were not accustomed to this structure, they had a difficult time with the task.

Jen:	However you want to do it. (five-second pause) What's the first thing you guys are gonna do? What's the first, the first thing you guys think you should do in order to tackle this challenge today?
Shakeem:	Figure out what the hell we're looking at. ((*Several people laugh*))

Jen: Okay. All right. I would like, here's my goal, I would like by the end of today to have a new lesson that I can stick in the binder. And if it works, then maybe what we can do is next week, we can pick, we can go through my binder and pick something else out of the binder and do another lesson.

Shakeem: You're getting' a little excited about this, now huh?

Jen: I *am* excited about this because I think this is a really good opportunity for you guys to like, put, put yourselves into this and put what your interests are into this. I mean lately its just been like 'what do you like, what do you dislike, what do you think we should change.' Now I'm saying, okay, let's, let's add a little bit of Linda, a little bit of Shakeem, a little bit of Ivory, a little bit of May into this curriculum.
(Video transcription, 7/28/03)

After consciously changing the structure of the daily routine, the students had more opportunities to contribute to the curriculum development process. Although this was initially overwhelming for the students and at times they were resistant to discussing or creating the lesson activities, they were able to add their perspectives to the curriculum in meaningful ways.

The group came to several new understandings about student voice, agency, and the challenges related to designing curriculum with students throughout the course of the eight-week project, however this chapter highlights two findings significant to Ian's experience and development: the students' interests and motivations and their alignment with the curriculum and the impact of bridges built between students and teachers.

Sex, drugs, and pyramids: What interests students and helps them learn

Researchers and practitioners have described the efficacy of a project-based curriculum (i.e., Banks, 1997; Harwell, 1997). In our study, the students iterated these claims using their own language. Even in the beginning stages of the project when Jen, Cassondra, or Ian were still heavily "teaching" the material, it was clear that the students were most engaged when they were participating in a hands-on activity. The students would often express their interest in lessons that incorporated such activities and could readily articulate which teachers were more engaging because of their use student-centered or project-based instruction. An example of this is evident in an informal conversation that took place after Ivory described a science class at City High that she disliked:

Jen: Why don't you get into (the class)?
Ivory: Like, my class, it's not a lot of hands-on stuff(?). And we just in the book everyday and that's it. We get work just to do it, it ain't interesting. I understand it as I go through but I forget it by the time the next year comes.
Jen: So you think, like hands-on, one hands-on activity every period would be-
Ivory: Not every period but at least once or twice a week.
Jen: Once or twice a week.
Ivory: It would help the class out.
(Video transcription, 8/6/03)

In this interaction, Ivory described the importance of hands-on activities in science class to aid her retention of the content and her interest level. She was generally bored by the teacher's reliance on the textbook, but felt that hands-on activities would make the class more enjoyable.

Ivory and Shakeem also gave insight into ways teachers might contextualize their interests and life worlds into a science unit. In the following interaction, Jen asked very generally what students like Ivory and Shakeem find interesting, and how she could infuse their interests into a unit on communicable diseases.

Jen: Put yourself back into like, high school, I'm in school mode for a second. What do you think, what do you think kids get most into?
Ivory: What do they get most into?
Shakeem: It depends on what kind of kids you talkin' 'bout.
Jen: Kids like you.
Ivory: Drugs and sex.
Shakeem: Pretty much.
Jen: Okay. How can we, um, how can we get drugs and sex into a unit on communicable diseases.
Shakeem: Well, if you use drugs, it kinda disorients you, so you not, well, most people, can't focus and stay on track, and they let their physical feeling, like, how can I say, being horny, affect smart decisions, like ya so horny, ya say I don't need a condom, you don't and you do it anyway, and you get a communicable disease.
(Video transcription, 7/28/03)

In this interaction, Ivory and Shakeem were quick to describe things that may be considered bad influences (sex and drugs), yet that they find interesting. Both were also quick to speak on behalf of their peers. Initially, Shakeem sought to distinguish "what kind" of student Jen was inquiring about, which suggests that he perceived that different types of students have different interests. After Ivory casually mentioned "drugs and sex," as things that were interesting to

"kids like [them]," Shakeem was immediately able to contextualize the themes into the unit on communicable diseases and gave a logical explanation that could serve as an engaging introduction for such a unit.

An important aspect in this interaction was Jen's willingness to listen to the students rather than quickly shutting them down when they broached what she might have considered inappropriate topics. She gave the students the respect and authority to voice their own insights rather than truncating their agency, which may have occurred, had she not allowed them to expand on their contribution of "sex and drugs." Rather, she was committed getting a better sense of the students' cultural capital, or their cultural resources and knowledge.

When asked about teaching strategies that help him learn, Shakeem described a way of incorporating his interests into instruction:

> I like music. If you can find any kind of way to put music to anything I'm learning that involves like—if you say, you teach me something—say I'm gonna teach you this, and then, when it's all over, I want you to teach it to the class in a rap. 'Cause that way I gotta figure out everything about it, to know exactly what I'm gonna—so, so the words I'm coming up with I have to know what I'm talking about, because I'm making a rap about it. (Shakeem, video transcription, 7/28/03)

Similar to Ivory, Shakeem expressed the desire for deeper understanding and retention of the material. By creating a rap, he would be able to synthesize the concepts he had learned and put them into his own language. Consequently, Shakeem would have to fully understand the concepts he would use, just as a student would in a more traditional assessment, such as a research paper or a presentation. However, creating a rap would be much more engaging to him and would enable him to express himself in a unique way. Encouraging students to create their own raps would also be another way of incorporating students' cultural capital into the curriculum.

Ian took advantage of the students' individualism and encouraged them to consider concepts and activities for the curriculum that would be engaging to them. Even if the students' ideas strayed from the original lesson objectives within the original Letus units, Ian felt it was important to let the students work according to their own interests and motivations.

About halfway through the summer project, Ian took the students on a field trip to the construction site where the city was building a new professional baseball stadium. While they were on the trip, Ian and the students created a video of their experience in which they took a tour of the site and talked to several of the engineers and construction workers. Ian felt this trip was an optimal way for the

students to identify practical applications to the mechanical physics concepts targeted in the curriculum. After they returned from the trip, Ian encouraged the students to create activities that included elements of the trip or incorporated other ideas connected to construction and the physics of machines that they found interesting. Ivory and Linda spent time editing the video they had recorded during the trip so that it could be used in the curriculum.

Shakeem, however, was interested in creating a learning game. The vignette below shows how he and Ian worked together to negotiate the specifics of the activity. At this point, Ivory and Linda were nearby editing the video.

Ian:	Okay, well just write (the game) up.
Shakeem:	I gotta figure out, I gotta think first. Now a game–
Ian:	Sure whatever, however you want to do it.
Shakeem:	What kind of game? What kind of game you lookin' for?
Ian:	I want it to be part of, like, something that you would do in class, so like part of the lesson or whatever. Like how would it fit in the lesson?
Shakeem:	Maybe, right, just maybe, you could watch that tape right there right and then after you all done with it, and then, you gonna ask your ques–, no that don't got nothing to do with pyramids though
Ian:	It doesn't have to, it can just be about the video.
Shakeem:	Yeah, you ask questions about the video, but it don't got nothing to do with pyramids does it, that video don't got nothing to do with pyramids.
Ian:	All right. But it relates to how pyramids are made, right?
Shakeem:	All right well this is what I was thinking. You watch the video, that one right there, when they done with it, and then you gonna get questions asked about the video.
Ian:	Okay.
Shakeem:	Then, you get them in groups. And when you get a question right, you're gonna have to put a block onto your pyramid ((*Turns to Ian*)) you guys know where I can get some blocks at, like some legos or something?
Ian:	Today?
Shakeem:	No not today. I just need to know–
Ian:	You mean buy them? Or me get them for you?
Shakeem:	Yeah, I mean, I don't need them, but if you want to do the project you might need them. I don't know what I could build a pyramid out of.
Ian:	Well we can figure that out later. Go ahead.
Shakeem:	So anyway, if you get your question, if your group get the question right, then you get to stick a block on your pyramid. And whoever gets their pyramid done first, they win. That jawn (thing) gonna be thorough.
	(Video transcription, 8/8/03)

Earlier in the work on the physics of machines unit, Shakeem had expressed an interest in the construction of pyramids. Throughout the project, Ian encouraged him to continue his inquiry of pyramids as a way to think about the physics concepts. Throughout Shakeem's brainstorming session about the game, Ian continually pressed him to do whatever he wanted. Even though Ian frequently interjected during the exchange, Shakeem formulated the rules and procedures for the game with little direct help from Ian. Throughout the interaction, Ian was open to Shakeem's input and recognized his ideas as legitimate and resourceful ways to engage students and apply the content of the video. After negotiating the game idea, Shakeem and Ian spent about an hour writing the idea into a lesson plan to be used within the new curriculum.

In essence, the project was a means for Ian, Cassondra, and Jen to make inquiries into the interests of the students involved. May, Linda, Ivory, and Shakeem served as proxies for other students in the Philadelphia schools who would be targeted with the curriculum. Working collaboratively, the participants were able to create interesting, instructional lessons that were contextualized in the students' interests.

Not only did Ian produce a set of viable activities that he would be able to use in the physics classroom, he also gained experience in the process of utilizing student voice. By structuring the curriculum development activities in a way that fostered students' power to make decisions and incorporate their interests into the curriculum, Ian was able to get a sense of what it means to utilize student voice to impact curricular and instructional planning. Additionally, Ian was able interact extensively with the students and learn more about their worldviews, dispositions, and personal interests.

Building bridges between teachers and students

At many points during the summer, the group participated in cogenerative dialogues that revolved around the students' experiences in classrooms. A considerable amount of time was devoted to discussing effective or conversely, ineffective teaching practices and how teachers can unwittingly disrespect students. One morning the students spent time talking and writing about their own experiences with respect in school. Ivory wrote, "Respect is not something that just comes along with a person. It's something you have to gain" (Ivory, journal entry, 7/11/03). Ian was particularly interested in the notion of respect and its implications for building relationships with students that would encourage classroom learning. He spent a substantial amount of time talking to Ivory, May,

Shakeem and Linda about what teachers do to either gain or lose respect with students like themselves.

Ian's strategy of listening to the student researchers and his respect for their input allowed him to gain symbolic capital, or status as a caring, respectful teacher and someone they could trust. Even though the student researchers spent the least amount of time with Ian, they continually raved about how much they enjoyed working with him. His rapport with the students was built on respect, which Linda described in a journal entry:

> I found Ian's class to be the most interesting. Honestly, his class has the most respect. Everyone listens to him and everyone had questions for him about the lesson. And believe me when I tell you that Ian was determined to help make you understand. (Linda, journal entry, 7/18/03)

Even before the adult researchers came to the conclusion that they needed to empower the students more during the summer project, Ian generally avoided taking the typical teacher role. Instead, many of his conversations with the students revolved around issues at City High and their lives outside of school. Although Ian spent the least time "teaching" the physics content or replicating the activities in the original unit, the students began to see him as a teacher figure that deserved respect. The students claimed that they were least interested in his curricular topic, but they looked forward to working with him.

The following excerpt was taken from the latter portion of an interview with Shakeem. After Beth's general inquiry into his feelings about adult researchers involved in the summer project, Shakeem began to explain why he really enjoyed working with Ian:

Beth:	So he was more like Rowhea (another researcher) in that he, like, let you do your own thing.
Shakeem:	No, he was more like Ian. You know what I'm saying. Ian do what Ian do. He don't talk much, but when he talk, (he) got somethin' to say. He don't do a whole bunch of rappin'. He'll tell you what he want, ask you if you got any questions, anything he can help you with. When you ask him to help you, he don't ever suck his teeth or take a deep breath or sigh, none of that, roll his eyes, be all slow getting up, Ian stop whatever he doin', right then and there, come ask you, what you need help with.
Beth:	Why do you think he does that?
Shakeem:	I don't know why he do it I guess that's just Ian's character. (Interview transcription, 8/13/03)

Shakeem's thick description of Ian's practices and personality illustrated the strong relationship that he and Shakeem had built over the course of the project. He also refused to compare Ian to Rowhea, a researcher who had worked closely with Shakeem during the previous two summers. Instead Shakeem emphatically placed Ian in his own category ("No, he was more like Ian."). The description given by Shakeem illustrates his respect for Ian after knowing him for only a very short period of time.

Shakeem chose not to give a description of Ian's characteristics at this point in this vignette, but instead focused on the qualities that Ian did *not* embody, for example, "he don't suck his teeth or take a deep breath or sigh." This suggests that Shakeem historically has experienced teachers who engaged in the practices that he listed—"he doesn't suck his teeth or take a deep breath or sigh, none of that, roll his eyes, be all slow getting up." To Shakeem, these practices represented disrespect and disinterest in him as a learner. In contrast, Ian was quick to help Shakeem, which made him feel important and respected by Ian. Because of the bridges the Shakeem and Ian had built, Ian had established social capital with him. Ian could use this social capital as exchange value to get Shakeem "on board" with certain activities or tasks. Because he trusted and respected Ian, he was more apt to engage in the activities for the curriculum development project.

Over the course of the summer Ian also built a trusting relationship with Ivory. He knew that Ivory was very interested in basketball, so they often talked about her participation in the City High team. When Ivory asked Ian for help in choosing her senior project topic, Ian was able to help her make a decision based on what he knew about her interests and motivation:

Ivory:	Ian, give me somethin' to do my senior project on.
Ian:	Uh, okay. Is there anything specific, it can it be anything?
Ivory:	Yeah, they say, as long as you add all the subjects in. It's gotta have a graph for math, history.
Ian:	Its gotta be one project that combines everything?
Ivory:	Yeah.
Ian:	Oh, okay. Um, well, you could do it about basketball. Yeah, you got a video (of yourself playing basketball) already, so that's one thing. And then you could talk about, I mean basketball's all physics, you and I can talk about that, go over that, that's science stuff. And that's math too, they're all together, right? Shoot the ball. Force of the ball, curve, how it flies, I mean it's not that complicated.
Ivory:	That sounds easy.
Ian:	You could talk about the history of basketball, all that stuff.
Ivory:	All right, so you gonna help me?

Ian: Yeah, sure.
Ivory: So when we stop workin' you still gonna help me?
Ian: Yeah, whatever you want, yeah, I'll come in whenever you want.
(Video transcription, 8/8/03)

In this interaction, several elements suggest that Ian had effectively built bridges with Ivory. First, she felt very comfortable asking him for help on a topic unrelated to the work they were doing on the curriculum development project. Rather than expressing his unwillingness to talk about something off-topic, Ian helped Ivory create a framework for a project idea he knew she would be interested in—basketball. In addition, Ivory asked Ian for help after their curriculum project was over, which suggests that she felt comfortable working with him on a one-on-one basis. By the end of the summer, Ian had established a significant amount of social capital with her because of his interest in talking to her about basketball and other things that were important to her. Similar to Shakeem, Ian could implicitly use this social capital as exchange value to increase Ivory's engagement with the physics content and the curriculum development tasks.

Opportunities for bridges to be built were also catalyzed when the adults attempted to incorporate the students' life worlds into the curriculum content. One morning, Jen led the students on a discussion of the spread of communicable diseases. The students were given a word problem and were prompted to figure out who started a disease, based on interactions between numerous individuals. The students were extremely engaged as they negotiated the problems as a team, with Jen serving a facilitator role. Throughout the activity, Jen allowed the group to listen to one of Shakeem's hip-hop CDs using the speakers on one of the office's computers.

Jen: So who started (the disease)?
Shakeem: ((*Laughs and then "sings" along with a passage in the music playing. He starts to talk through the problem*.)) Joe had dinner with Pete and Mike. Joe went to the movies with Sally. So now Joe rollin' with Pete, Mike, and Sally.
Linda: So all of them got sick, right?
Jen: Except for [Mike.
Shakeem: [Sally and Pete went to dinner, huh? Sally and Pete went to dinner after Joe got dropped off. All right, wait a minute. Gotta write this down. I'm going to find out who got this! ((*Sings along with the lyrics of the song as he is setting up the chair to sit down and write*)). All right then, wait a minute, Mike ain't get sick. Cause Mike just, see, this is how I

figure it out, this is how I figure it out every time and it always works for me. ((*Gets up and walks to the board where the problem is described and uses a pencil to point out connections as he explains*)) All right, look, Mike didn't get sick, right?

Jen: So he couldn't of done it.

Shakeem: So, the way I, you gotta do process of elimination. If Mike didn't get sick and he went with, uh, Pete and Joe–

Jen: Right.

Shakeem: That means anyone else who got interacted with Pete, I mean, damn it, ((*Points his pencil at the top of the filing cabinet and backs away from the board*)) it's a lot easier when I'm by myself.

Linda: Well maybe Sally did it, because, I don't know, yeah cause if he had dinner with Joe and Pete and didn't get sick then it's probably not them then.

Shakeem: Yes, there you go! ((*Points to Linda then walks back up to the board and continues to point to names as he continues*)). If Mike was with Joe and Pete and didn't get sick, then that means it must, whoever, it must–

Linda: Sally.

Shakeem: It's Sally cause she's the only one who was with Joe and Pete and wasn't with Mike.

Jen: So you say it's Sally. We all agree? ((*Shakeem dances in celebration*)) Excellent logic, Shakeem. Ok, ready, can I do another one? These are kind of fun. Can we do another one, another little mental game?

Shakeem: Puff Daddy was with J-Lo.

Jen: We could rewrite these—

Shakeem: Puff Daddy–no. First Puff Daddy was with Mariah Carey,

Jen: Right.

Shakeem: Then Mariah Carey went with Eminem.

(Video transcription, 8/6/03)

In this vignette, Jen had several opportunities to build bridges with the students. First, she showed Shakeem respect by allowing him to play his music during the session. Shakeem was able think through the problem while simultaneously singing along to the song. Even though he was singing, he continued to stay on-task. His commitment to solving the problem was evident when he threw the pencil after initially being confounded by the problem. Second, Jen let the students think through the problem and offered little guidance throughout the process. This was confirmed by her body language—she sat back in her chair and looked through her curriculum binder throughout the activity. She served as the students' equal by working and negotiating with them, rather than showing her teacher authority by explaining the answer to the problem to them. Finally, once Shakeem began to talk about changing the problems to include popular

hip-hop artists or celebrities, Jen immediately let him proceed with the idea. In this, she involved the students' interests, instantly making the problems more relevant to their life worlds. In each of these examples, Jen changed the structure of the learning environment for the students, which empowered them work together efficiently and to appropriate the resources needed to solve the problems successfully.

What affect do these enhanced bridges between teachers and students have on the classroom context? One of the central ideas around building a community of learners, either in a classroom or in the smaller confines of our curriculum development project, is collective participation built on trust and respect of other coparticipants. If communities of practice encourage participants to build relationships over a period of time (Lave &Wenger, 1991) and the communities are spawned by things or ideas that are important to individuals (Wenger, 1998), a natural ingredient for a community would be the connections between participants, regardless of their status as students or teachers. In this project, when the adults were able to build bridges with the student researchers based on trust and respect, the logistics of the project became less constrained and it was easier for each member of the collective to participate fully in the project. Thus, the construction of bridges between the varied participants in the project was essential to creating community.

Discursively constructing science knowledge: A metalogue

An important consideration we had throughout the summer was also the educational validity of the project—we hoped the students would have the opportunity to talk about science and gain understandings with regard to the objectives outlined in the original curriculum, especially since the students would probably not have the opportunity to take advanced-level science courses in high school. Although the project focused on the students as coconstructors of the curriculum, as educators we recognized the potential for meaningful, student-centered learning during the summer. We hoped to discover new ideas and increase our understandings of the science concepts as a group in the true spirit of a community of learners.

Although we did not do any formal assessments of the students' learning during the project, the vibrant conversations that took place over the eight weeks demonstrated the students' opportunities to wrestle with many different concepts and their applications. This was particularly evident in Ian's work with the students on the physics unit—none of the students had taken physics before, so the content was entirely new to them.

Rather than describing our perceptions of the project's outcomes in narrative form, we critically discuss the students' learning in the following metalogue. We consider how our goals for the students to learn science and engage in science discourse overlaps with some of the other issues discussed in this chapter, such as utilizing social and cultural capital and letting student interest drive inquiry in science. Since the students' learning can be viewed as their production of scientific discourse, we chose to use metalogue to discuss this aspect of the project. In a metalogue, our goal is to represent a "discursive construction of knowledge." In other words, the metalogue itself is reflexive in that we further extend our constructions of the analysis as we engage in an inquiry-driven discussion (Roth, McRobbie & Lucas, 1998).

In addition, most of the data previously utilized in this chapter consists of short dialogues, which constitute the main form of text for analysis. Our reactions and analyses of these texts focused on students' meanings not as objective truths, but rather as a reflection of the sociocultural context in which the discourse took place. Thus, the students' production of new knowledge was based heavily on their own life worlds. Our analyses of these texts are merely constructions mediated by our own life experiences as authors, students, teachers, and researchers. In a metalogue, we proxy the types of dialogues held by the students as we explore the means by which students talked about science throughout the project.

Beth: The name of the unit you covered during the curriculum development project was "How do machines make big things?" I assume that was the driving question that was built into the original curriculum. How do you think the students responded to the unit, especially since they were charged with helping to reconstruct it?

Ian: Frankly, the students were less than excited about the unit. It was meant to teach physics concepts through the use of large-scale machines and construction. In addition, it was supposed to use the surrounding area as a context, so the original curriculum was written for schools in Detroit. Therefore, they discussed in detail the construction of specific buildings in Detroit. Making the connection to Philadelphia was not so simple, especially since the videos and information that were available in the original unit did not necessarily apply to our context.

Beth: So the materials that were already made were really not applicable to the kids in Philadelphia, meaning you needed to make some changes there. What else was good, if anything, about the original curriculum? Did you use any of the activities with the kids that

they prescribed? To me it seemed that more than Jen or Cassondra, you let the students take the unit in their own directions.

Ian: The curriculum was good in that it had clear concepts to be taught and used real-life examples for the students to see. These real-life examples were also discussed via the videos and stories provided. In addition, there were several simple experiments and demonstrations included. The major issue hindering the adaptation was the grade-level variation. It was difficult to adapt a curriculum written for middle school students to a high school level. Many activities were too simple and required a lot of modifications.

Beth: I remember that you did a very early activity with the students in which they had to write down their predictions about things, do you remember that activity? I think that was one of the few structured activities you did. It was soon after that you really let the students investigate things that were interesting to them, for example, when Shakeem was interested in pyramids.

Ian: That activity you described from the beginning of the summer is a good example of an experiment that was too simple for our students. It did lead to some discussion about the concepts, but the methods needed to be altered. After realizing how much change needed to be made I did encourage to students to investigate more on their own. I felt that within a class structured around science and with general goals outlined, the students' interests would lead to quality learning of the subject matter, but it would be based on their interests. For example, some students were interested in toy robots, which might seem to be off the subject of building big things, but really it led to a quality investigation about current work with robots and physics. However, as a result of our work over the summer, I think that the students left with a decent understanding of force, construction, work, energy, design, drafting, research, and simple machines.

Beth: I remember all of those as recurring topics that the students talked about throughout the summer. However, something that I find interesting is that I don't remember you having to do a lot of work to build social networks with students before they got involved in learning and working on your unit. Do you think the students' literacy with the science concepts dovetailed with your attempts to build relationships with them? For instance, we often talk about social capital or other types of capital being exchangeable for the production of culture. How did your attempts to build social capital with them affect their desire or interest to get involved in the activities you planned or facilitated? And more importantly, how did

this capital exchange encourage them to explore the science concepts?

Ian: I think the self-driven, relaxed structure of the class was a major motivation. Although that sounds counterintuitive, I believe it to be true. Some students are simply resistant to work because of the way it is presented and therefore have little desire to really think about the concepts and do quality work. In a classroom where there is more pressure put on the student to produce something that isn't important to them, they concern themselves less with the work that is required and focus on simply completing the task. I did attempt to build social capital with the students, but I guess that goes along with what I just stated. The project was less about them or me and more about us together with me helping them complete their projects. The students knew there were educational goals involved because I made that clear, but they also felt less restricted. Also, when the students felt the work was personally important they seemed to retain more of the information. I also believe that they will be more likely to investigate the topics they were interested in again in the future.

Beth: I guess a good example of that was Shakeem's interest in how the pyramids were constructed, although I can't remember how he became interested in them during the project. I'm also interested in how you assessed that he actually learned something given the laid-back nature of the project. To me it was evident that they were learning because of the level of discourse around the topics, for instance, after the trip to the construction site, they were able to talk about the machines using the physics terms that you had hoped they would learn.

Ian: Shakeem became interested in pyramids when we started comparing old construction methods to new ones and talking about how things were built without major machines available. I was able to assess his learning based on the work he produced and his engagement in the creation of a few different activities for the unit. He actively searched the Internet and created a project for students to do. He did this on his own with me there only as a guide.

Beth: I remember him really wanting to assess the construction video information as a game and the two of you negotiated the activity, including the learning objectives, the materials and how it would be implemented. How well did the kids respond to the trip to the construction site? I know that was in the original curriculum, and it was great that the construction site you picked (the new baseball stadium) had some relevance to the students' life worlds. That is, rather than visiting an apartment building or a strip mall, you

visited the sports complex. Were the students able to engage in discussion with any of the engineers or construction workers about physics?

Ian: The students responded well to the site. I think they were less impressed than I anticipated, but at the same time it gave us something to build and reflect on. Some issues arose that I did not foresee, specifically in Ivory's case, because she was very interested in the politics of the worksite, such as the power structure and hiring issues. She was disappointed to not see many women working there. Although her interest was off-topic in terms of the physics curriculum, we had an interesting discussion when we returned from the trip about gender norms. The two men that provided the tour were excellent and answered all the questions presented. The students got to talk to them about how the cranes are designed in certain ways, why some machines are limited in the tasks they can perform, and how the stadium can support itself.

Beth: I got the sense that none of the students we worked with had taken a course in physics previously in school. I wonder whether it would have been better to have students involved in the project that really understood the concepts and could immediately get started on writing the curriculum.

Ian: I agree that they had little to no experience with the subject matter. In the very beginning we discussed some of the concepts, but none of them seemed comfortable with them, especially when it came to describing how real machines worked. I think it was best that the students were not experts because this led to quality learning for them, both in terms of the physics and also in terms of their efforts with the curriculum. It really led to authentic learning for the entire group, myself included. I was able to directly assess how they learned and they too could assess what they needed to know to investigate something further, for example, as the girls wanted to find out how the toy robot pets work.

Beth: I remember that sometimes the students were resistant when they thought things were too scientifically theoretical. At times, I noticed that they wanted to just listen to music or to get on the Internet to do other things not related to the curriculum.

Ian: To me, music was not much of a distraction. I did not see it slowing down the pace of the students' work, so I usually let it go, and actually in the case of Ivory and Shakeem I think it helped them to be more productive. I think that most of the issues that arose were because of the way the task was presented in the original curriculum. I think the students felt they could investigate their own interests

more while we were working on my unit as opposed to the other units, and that cut down on distractions.

Beth: The last thing I want to discuss is the girls' interest in the robotic pets. I know Linda and May did a lot of research on them, which as you said earlier, took them away from the initial objectives and driving question. I know that would be difficult for some teachers to deal with, even during a project like ours. Although it was not a structured classroom environment, there was still an agenda to be followed. I am wondering how you felt about their project, because you seemed very willing to "go with the flow" throughout it all. Also, I enjoyed the opportunities we had after the field trip to talk about the issues Ivory observed on the worksite as you mentioned earlier. What an opportunity for interdisciplinary learning!

Ian: The robotic pet project the girls started working on was very interesting to me even though, as you said, it was a stretch from the intended topic. But I felt at the time that there was always a way to bring it back to the issues we were discussing. Unfortunately we did not have much time to do extensive work with that project, but we did talk about robots in general and how physics relates to them. If we had had more time I would have structured the next few meetings around the topic of robots. There is currently an expansive amount of work out there that uses robots to teach physics and with their interests piqued it would have been perfect to introduce it at that time. I find that once the students' interest is there, you can accomplish so much more.

Emerging understandings

One of the points suggested within our metalogue is the overlapping understandings that emerged for Ian and the students during the course of the summer project. The students' discursive construction of knowledge overlapped with their work as curriculum developers. In other words, as they investigated things on their own accord to incorporate into the curriculum, they were also actively engaged in expanding their own constructions of the science concepts they were investigating. In addition, Ian's interest in building social capital with the students also played into their discursive construction of knowledge. The students' desire to work with Ian was augmented by their respect for him. In a sense, the students had "bought in" to Ian's ways of conducting the summer project and were very engaged in learning about some of the concepts in order to develop the physics curriculum, even though they initially thought the content was boring and were not intrinsically motivated to learn about how machines work.

Although the students did not initially want to learn about the physics concepts, Ian was able to successfully build social capital with them and gain understandings about their lives and interests that would feed into the curriculum.

Being the first attempt at this type of curriculum endeavor, the project was not without problems. Since we had no framework from which to model our practices, time was lost during the first few weeks of the summer when the students could have been actively working as curriculum coconstructors *alongside* us rather than simply expressing what they liked and disliked about the original lessons. However, even during the first few weeks of the project, the students gave germane insights into their interests and what they might change about the lessons, so all was not lost. Also, even during those early weeks, the group began to build bridges that disregarded any cultural or social differences between them.

The students' opportunities to wrestle with the content, methods, and context of the original units were mediated by their valuable histories and experiences in classrooms as students, as well as by their lives outside of school. Even though the students were by no means experts on pedagogy, curriculum development, teaching methods, or the science concepts targeted, they were able to funnel the content into activities that would make the units interesting to a group of students they were well acquainted with—students like themselves. From his work with the students, Ian, as a beginning teacher, was able to learn how he could make his physics teaching more culturally relevant as a result of the students' input.

Ian also had a firsthand opportunity to see the power of student voice and the ways in which he could either constrain or empower it as a facilitator. Throughout the summer, Ian reiterated his interest in ascertaining the students' definitions of respect both in school and on the street. Ian could then use this information as a means to better understand students like them—students that he would work with throughout his career as an urban science and math teacher.

Finally, in considering the summer curriculum development project through a structure/agency lens, we came to greater understandings about what it means to expand the roles of students and teachers. During the project, the adults learned about ways that they could structure the environment to enhance the students' agency, particularly by empowering them to incorporate their interests, lives and ideas into the curriculum. Ian and the other adult researchers had opportunities to foster students' access to resources so that they could act in creative, innovative ways that would concurrently meet their own needs. In essence, Ian had opportunities to learn about human agency and how he could structure his classroom in ways to empower students to make decisions about teaching

and learning—students like Shakeem, Ivory, May, and Linda, who in many ways had been marginalized and disempowered throughout their schooling experiences.

4 Getting a job in an urban school district

After finishing a graduate-level teacher preparation program and receiving his state certification in physics and math, Ian was ready to start working. His success in student teaching was affirmed by the summer curriculum development project; during the eight-week experience he had opportunity to develop science curriculum with students from City High School. Ian was eager to get into the classroom and apply what he had learned. However, he found that attaining a teaching position in the School District of Philadelphia was more involved than he had imagined. Delays, disorganization, and miscommunication almost caused him to give up his aspirations of working in the district.

This chapter chronicles Ian's experiences while trying to secure a teaching position in a large urban district in the United States. This aspect of his story is significant for two reasons. First, teacher turnover statistics from the School District of Philadelphia indicate that over half of the cohort of teachers hired in 1999 had left by 2002. Even though the district has a continual need for new teachers and hires a large number of individuals on a yearly basis, Ian found that the hiring policies made his entry into the district quite difficult and was not structured to easily get new teachers into the system.

Second, Ian was considered a highly qualified teacher according to the standards set by the *No Child Left Behind* Act because of his certification in physics and math. Due to shortages, math and science teachers are in high demand in many areas of the United States and in many areas of the world. However, even though he applied to the district in April 2003, he did not hear about his status as a potential employee until late August, only two weeks before the start of the school year. For other more impatient individuals, such late notice might have been a catalyst to seek a position elsewhere, perhaps in another district.

Luckily, Ian's situation worked out favorably, but not without tribulations. In essence, it is important for new science and math teachers who are considering

a career in a large urban district to be aware of the structures that might influence their efforts as they attempt to secure a position.

Background information: The state of the school district

An important preface to Ian's hiring story is a short account of the recent events in the history of the district. As of 2003, Philadelphia was the seventh largest school district in the United States, based on total student enrollment. The district web site claims that as of November 2003, 214,350 students were enrolled in its 276 public schools, which include Head Start (a national nonprofit school readiness program), preschool, elementary, middle, vocational/technical, magnet, and senior high schools.

Like other large urban districts, the district has faced continual budget challenges. The district web site includes a statement that addresses its fiscal woes:

> For 2001–2002, the School District of Philadelphia has a $1.749 billion operating budget. Since 1989, the operating budget has failed to keep pace with inflation increasing enrollments. The impact of these factors contributes to the current $100 million deficit. The estimated per pupil expenditure for 1999–2000 was $7,669. Although this is a slight increase over previous years, it is still significantly lower than the average per-pupil expenditure of the majority of the surrounding school districts. (The School District of Philadelphia website, http://www.phila.k12.pa.us/aboutus/)

The budget concerns are compounded by the students' financial situations as many come from conditions of poverty. Approximately 80 percent of students are eligible for free or reduced-price lunches, however, each of the schools offers breakfast and lunch to its students free of charge regardless of its individual socioeconomic breakdown. In US schools, students whose families fall below a certain income level can receive a school lunch for free or at a discount. In addition to the "culture of poverty" (Wilson, 1987) that surrounds many of schools in Philadelphia, a preponderance of other issues plague the district.

> Two-thirds of [the district's] children come from low-income families. Nearly six in ten of its freshmen never make it to graduation. The very best scores on a national standardized test last fall showed tenth graders reading at the fortieth percentile; the worst showed third graders doing math at the twenty-first percentile. Classrooms bulge with thirty or more children. Buildings are in disrepair. Teachers leave too often for suburban schools. (Gewertz, 2003, p. 1)

In 2001, the district's poor academic performance and economic issues were so overwhelming that a state takeover became imminent. Despite protests by many at the local level, the takeover was approved and resulted in restructuring the governance of the district, among many other changes.

The state takeover

On December 21, 2001, Philadelphia became the largest school district ever in the United States to be taken over by a state. After years of disputing how to repair the multiple fiscal and academic hardships faced by the district, leaders at the state and local level agreed to grant control of the district to a School Reform Commission. The governor and the mayor would be charged with appointing individuals to the commission. The five-member group, referred to as the SRC, was responsible for leading the district and for choosing a chief executive officer (CEO). Despite mixed review, the commission chose an individual who had previously led Chicago's school reform initiatives to serve as a leader for Philadelphia's public schools. In addition to the CEO, the management structure also included a chief academic officer, chief operating officer, and chief financial officer.

One of the first items on the School Reform Commission's agenda was overhauling the district's worst performing schools. In the spring of 2002, the School Reform Commission chose a list of private school managers to run the forty-five lowest performing schools. Once again the district made history; relinquishing the ailing schools to private groups was the largest such effort attempted in the United States. A subset of the district's schools were grouped into three categories: the forty-five lowest performing would be managed by outside firms; twenty-five troubled schools would be reconstituted by the district or transformed into charter schools; and sixteen schools that were struggling, yet gaining progress would receive additional funds. Additional state and city finances would contribute to new textbooks and additional teacher training (Gewertz, 2002).

According to a May 2003 article in *Education Week*, the teacher's union in the city gave the newly appointed CEO support for his programs and initiatives in the district, which was an odd occurrence given the long-standing disaccord between the union and past district leaders (Gewertz, 2003). The Fall 2003 issue of the *Reformer*, a publication issued by the school district itself, reported that "eighteen million dollars worth of new textbooks, a standardized curriculum geared toward state proficiency standards, more time for reading and math, a record number of qualified teachers and school-based parent help desks, run by

parents for parents" (p. 1). Most of these initiatives were created in the second year of the district's restructuring.

Overall, educators in the district currently continue to struggle with the mixed messages they encounter on a daily basis as a result of the state takeover and the constant changes that occur (Niesz, 2003). Researchers, educators, and community members persist in debating the efficacy of programs that have been implemented, such as the controversial standardized curriculum (Socolar, 2003) and the efforts of the outside management groups now instated in some of the schools (Travers, 2003). Essentially, the climate of the district during the state takeover and the implications from it form an important preface to Ian's experiences in navigating the district's centralized hiring system.

The chaos begins: Seeking a job

During the last month of his student teaching experience at City High School, Ian filed his application with the School District of Philadelphia. In April, representatives from the district's human resources department came to the university where Ian was enrolled to recruit new teachers. First, two different individuals interviewed Ian. Then, the human resources representatives used a rubric to assign each candidate a score, which was then used to create a rank of prospective teachers. Ian described the ambiguity in the ranking system:

> You get rated on your interview and, I don't know how they rate you, but depending on that rating you get, that determines how you get to choose, or what order you get to choose. Your interview is just to make sure you're, like, a normal person; that translates into your grade, [which determines] your rank. (Ian, inquiry group meeting transcription, 11/4/03).

At that point in time, all of the hiring for the school district was centralized, meaning that individual school administrators did not interview and hire prospective candidates. Instead, the rank candidates received from their centralized interviews affected the order in which they could choose their school placement from the district's vacancy list. During these interviews, Ian was told that he would receive a letter by July 15 that would list his score and rank. The letter would also give him a specific date upon which he would have to go to the district headquarters to choose his school from those with vacancies in his teaching areas. He was also advised to continue to search the vacancy listings on the School District of Philadelphia web site. Specifically, he had hoped to secure a position at City High School, where he had done his student teaching:

I taught at City High last year so I was, like, in the system whatever. So the principal there requested to have me stay there again, but she didn't really have any say in the matter I guess, plus she got fired, moved or whatever. Anyway I wanted to be at City High School. (Ian, inquiry group meeting transcription, 11/4/03)

According to the district's hiring policy, prospective teachers must fill out a standard teaching application. Once the candidate's file of paperwork is complete, which includes a background check and copies of certification materials, he or she is called in to make a selection from the centralized vacancy list. Both the selection and hiring processes take place centrally in the district office. Some schools have chosen to participate in the "site selection" process in which candidates apply directly to a particular school and are interviewed and hired by the administrators at that school. However, according to the district's union guidelines, teachers in an individual school must have a majority vote of the union members (among the faculty) for site selection to become standard policy. As of 2004, only 44, of the district's 264 schools had voted for site selection and participate in this policy (Useem & Farley, 2004). The rest of the schools used The rest of the schools used the centralized hiring system. Ian followed the centralized selection and hiring protocol of the district, which according to the website, is described as follows:

In order to become a regularly appointed teacher, an applicant must successfully complete the School District of Philadelphia's selection process for their specific teaching area. The selection process will include an essay evaluation, an interview, and reference checks. Additional weight is awarded to passing candidates who have done their student teaching with the School District of Philadelphia, to those School District of Philadelphia long-term substitute teachers who are in at least their sixth year of service, and to those who have asserted Veteran's Preference. An eligibility list of successful candidates is generated and forwarded to the Office of Employment Services, who will then contact candidates for hiring.

Throughout the year, the School District of Philadelphia will conduct hiring sessions for candidates who have been successful in the selection process. Candidates are invited to a meeting during which time they will select positions.

Candidates for teaching positions attend a meeting with members of the staff of Employment Operations. Employment information is disseminated and all credentials are reviewed and copied. Candidates are provided with a vacancy report listing available positions at all schools. Information concerning the location of the schools and other instructional information is provided. Principals and their representatives are often in attendance to provide information concerning their respective schools.

Candidates then meet individually with a member of the staff to discuss their options and make a school selection. All related personnel procedures including benefits and

certification are then completed. The candidate is provided with an assignment introduction and an identification card. (http://www.phila.k12.pa.us/offices/hr/hireproc.html)

A few weeks into the summer, Ian applied with other school districts in the surrounding area because he had not heard anything from the School District of Philadelphia. He listed his application online with a statewide application and employee placement program, with hopes to be matched up a hiring district. He also went to interviews at two charter schools in the city. By the end of July, Ian had received job offers from one of the charter schools and from a school district in suburban Delaware. In keeping with his commitment to urban schools and to the school district, he turned down both offers and continued to wait to hear from the School District of Philadelphia.

By the middle of July, Ian had received two letters from the School District of Philadelphia that listed his ranks and scores, based on his April interviews and the district's review of his credentials. He erroneously received one letter for his physics certification and one for his math certification. However, the letters did not advise Ian as to when he should come to the district's headquarters to make his school selection, as the human resources representatives had previously claimed.

Even though it was not an issue for Ian, he explained the confusion that sometimes ensues in human resources if one applies with multiple certifications:

I was in the system, and I'm certified in physics and math, so I applied to the school district and I got a reply. I told them I was [certified in] both things, if you're two things [certifications] they also think you're two people sometimes. (Ian, inquiry group meeting transcription, 11/4/03)

At the end of July, Ian called the district to get more information about his hiring status. He told the human resources office that he was going away on vacation in mid August and was worried about his placement. The individual with whom he talked told him not to worry. She also mentioned that the hiring department was behind in its placements and was not sure when he would be invited to make his selection.

On a Friday in August, the day before Ian was supposed to leave town for a family vacation, he received a call stating that he had been hired and needed to come in the following Tuesday to choose his school. Unfortunately, Ian had to miss his selection appointment because of the vacation, even though he had been told beforehand that he would get at least one week's notice:

The reason I had missed my time was because [someone] at human resources . . . told me the week before my trip that I definitely would get at least a week's notice before I had to come in. But as it turned out I got a letter the Friday I was to leave, telling me to come in the next Tuesday, when I would be away. (Ian, journal entry, 8/25/03)

Luckily, Ian's friend Jack (his coteaching partner from City High School) was willing to make a selection for him while he was away—Ian simply had to write a letter stating that Jack had permission to choose for him. According to Jack, the selection activities took place in a large room at the district's headquarters. Jack waited to speak individually to a district representative who showed him the list of available schools. Once Jack selected his school, the district representative crossed off the position from the list.

Even though Ian would have preferred teaching physics to math, Jack found that there were no physics openings. From the eight math positions, Jack blindly chose Leach Learning Academy for Ian after selecting City High School for himself. Ian explained the chaotic experience as follows:

August comes and I call in because I was going away on vacation. I asked, "when are you going to call me in, cause I have to go away," and they say, "Oh, [your selection] won't be next week—we wouldn't tell you tomorrow to come in the next day." So of course that's what happens, and I had to go and get my friend to go in and choose for me at that point. So you go in and like they have a list of schools that are available, and then you say, they just say "come up," and you go up and they say "this one got crossed off" so you say "I'll take that one," and then, it's like, random, and so I ended up where I am [at Leach Learning Academy], but I didn't know anything about it. (Ian, inquiry group meeting transcription, 11/4/03)

After Ian returned from his trip and found out about his placement, he was disheartened to find out that he would be teaching math instead of physics, especially since the district had mentioned its need for qualified science teachers.

Also there is still the matter of the non-existence of any physics positions. At new teacher training they told us that because there is such a lack of science certified teachers in the district they had to hire teachers from India. (Ian, journal entry, 8/25/03)

Additionally, the human resources representative told Jack that Ian still had to complete paperwork at the district hiring office, even though Ian had previously been told that his file was complete. His subsequent trip to the district office also proved to be frustrating.

I went down there the next week and wandered around the building for about an hour and a half trying to find help. Everything in the building was so spread out. In the end I was done, but later I realized they didn't have a copy of my license there, even though they said I had everything they needed. So I still have to go in and get that copied. (Ian, journal entry, 8/25/03)

Once Ian was assured that his paperwork was complete with the district, it was up to him to go to Leach Learning Academy to meet with his new principal. He explained the situation as awkward and unwelcoming in that it was up to him to take the initiative:

So once you choose your school, it's sort of up to you to find out what you're doing because the job that was described probably isn't what you're doing. So you got to get a hold of the principal somehow—that's like a nightmare of course—and then get over there. (Ian, inquiry group meeting, 11/4/03)

Ian had finally secured a position, however all of this transpired only one week before the school started, which was also the week that the district's new teacher training program began. Unfortunately, the training session added further frustration to Ian's induction experience.

Speaking of new teacher training, what a huge waste of time. The training is two weeks, Monday through Thursday, 9:00 A.M. to 1:00 P.M., and it basically focuses on elementary school. So far I have not heard anything new or "exciting." Mostly the classes consist of the "new teacher coaches" talking at us about how to write a lesson plan, or how to make sure the students know you are the boss. The most ridiculous part of it all is that all new teachers, regardless of teacher's background, have to come. Another problem is that we are not separated into grade level groups so some days all that is covered does not apply to me. All that is combined with the fact that they treat us like fourth graders leads to some negative attitudes. (Ian, journal entry, 8/25/03)

Several issues emerged in Ian's description of the new teacher training experience. First, the district employed a blanket approach for new teachers. Regardless of their experience, they were subject to the same training program. Also, some of the topics discussed in the training were irrelevant to Ian's position as a high school teacher. He spent time discussing issues that were specific to other grade levels or subject areas when he could have been setting up his classroom, working on lesson plans or preparing for the school year in other ways.

From Ian's account, it is easy to see how others might easily be aggravated by their hiring experience in the district. After two chaotic weeks in which he

received his school placement, met his principal, and completed the new teacher-training program, Ian settled in to his position as one of Leach Learning Academy's Core Plus III (integrated) math teachers. In the next chapter we expound upon the structural changes that Ian encountered in his transition from City High School, a large, comprehensive, neighborhood high school, to Leach Learning Academy, a smaller, magnet school.

Ian's account is not the only hiring story that is fraught with confusion. After Ian had been in the classroom for a few months, he participated in a group seminar with a cohort of preservice science teachers from a local university. During this "inquiry group meeting," which was meant to assuage the worries of other preservice science teachers, most of the veteran teachers that spoke reiterated issues surrounding the district's disorganized hiring process. Matt, a veteran biology teacher who had been teaching in the district for ten years, concisely described the problematic hiring process, and thus, our motivation for including Ian's hiring story.

> It's definitely like, you can understand why the city needs such good teachers, they'll claim [that they don't get quality teachers in the city because of] pay and that, but it's really the hiring process. I didn't apply anywhere else besides the city but I can imagine that if I had, and [another district had offered me a position in] May or early June [and said], "So we need to know now. Are you going to take this job for, you know, $10,000 more then they're offing in the city?" And you say, "I really want to teach in the city so I'll just wait until. . . . " And then you call up the city and try to tell them something and the person on the phone is like, "oh, let me pass you to this person." And when you finally do get someone you are treated as if they are doing you a favor by talking to you. It's a very frustrating process . . . it's a little bit humiliating, degrading. So you have to keep your eyes on the prize, like this is what I really want to do so I'm not going to let you guys change my mind. (Matt, inquiry group meeting transcription, 11/4/03)

The chaos continues: Getting placed again for the second year

We temporarily jump to the end of Ian's first year of teaching as he again faced the decision to either stay in the district or to move on. After Ian had been hired, he found out that his position at Leach Learning Academy was only one year in length because he would be covering for a math teacher who had gone on sabbatical. Therefore, Ian was in a unique position in that he had to go through the school selection process a second time. Once again, his experience was laced with confusion and misinformation.

Ian first had to call the district human resources department and inform them that he would reenter the pool of candidates. However, because Ian was

certified in math and physics, the district viewed him as two separate people. According to the district, at the conclusion of his first year, "Ian the math teacher" had one year of seniority, whereas "Ian the physics teacher" had no experience. This strange dual identity issue complicated the selection process in ways Ian could not quite grasp.

Similar to the previous year, he was unable to find accurate, useful information about the rules and policies for getting hired after a year in the district.

I have asked around and of course everyone has their own interpretation of the rules and has a story about their own experience, but none of it has really helped. I am not sure who to ask and who to trust. My building union representative helped a little, but I imagine things change so often that he is not exactly sure about it all. All I know is that if I don't start the process no one will. (Ian, journal entry, 5/23/04)

Most of Ian's confusion stemmed from the policies regarding seniority in the district. Seniority adds another level to the hiring and school selection process ess as it determines how soon a candidate may choose a new school. Newer teachers must wait until veteran teachers have been reassigned. But in Ian's case, he had two opportunities to choose a school. One was earlier than the other because of his dual status; in fact, even after Ian had chosen a new position, he was asked to come in to choose a physics job later in the summer based on his other certification. Throughout the confusion, Ian continually wondered how secure and accurate the entire process actually was.

I think it might be possible for someone to simply not choose and yet to continue receiving a paycheck. Also I think it is possible for someone to choose a job, go to work everyday, and never receive a paycheck. The lack of organization makes its way from the top all the way down to the employees. (Ian, journal entry, 9/12/04)

Besides the general lack of information and communication about the selection process, Ian still was not sure which school he should choose for the next year. In an effort to safeguard himself, Ian began to investigate job alternatives both in and out of the city. He decided to apply to a magnet high school that utilized the International Baccalaureate curriculum. Since this particular school did use the site-based selection hiring process, Ian applied while still at Leach Learning Academy. In late spring, he was contacted during the workday at Leach Learning Academy and asked to come in for an interview. A few days later, an administrator from the school called back to cancel the interview because of Ian's status according to the school district. It turned out that because he had one year of seniority as a math teacher within the district, he was ineligible

to be hired at a magnet school. According to policy, magnet schools can only hire teachers that are new to the district or have at least three years of seniority. Therefore, Ian was told that he had applied for a position he could not take.

The confusion continued when Ian later learned that he was in fact eligible for the position because as a physics teacher he had no seniority. Through an apparent loophole, Ian was offered the position at the magnet school. Ian turned it down in the end when he found out that City High would also have an opening for a combined math and physics position. The decision was not easy for Ian, especially when the principal of the magnet school questioned his desire to move to a struggling school.

> When I turned down the position, the principal at [the magnet high school] was really taken aback. Her tone of voice indicated that I was crazy for not taking the opportunity to teach at the magnet school. She was just really shocked that I would choose City High School over her school. (Ian, interview transcription, 6/30/05)

Ian found out about the open position at City High from Jack, whom he had continued to see monthly in new teacher support meetings. In order to actually get the position, Ian had to call upon some old colleagues at City High School. Through his conversations with Jack, Ian learned that the school had changed dramatically since he had student taught there the previous year. On the surface level, the changes mostly involved administrative adjustments. The principal had been reassigned and Carol, the small learning community coordinator with whom Ian worked had been made a vice principal. Also, one of Ian's cooperating teachers, Mister Reyes, had taken over the small learning community coordinator position. Two of the individuals with whom Ian worked closely during his student were now in positions of power at the school. Fortunately, both of them wanted Ian to return to City High to fill the science and math vacancy.

Near the end of the school year, Ian went to City High to meet with Carol (now a vice principal) and Mister Reyes (the new small learning community coordinator) to discuss the plan for the following year. At that point, because of the selection process, there was no guarantee that Ian would be able to select the job before someone else with more seniority. After the meeting, Ian realized that he was totally committed to returning to City High School and decided to take a chance. The vice principal made every effort to write up the job description in a way that it would be difficult for anyone other than Ian to be qualified for it. Because Ian was certified in physics and math, the job description mandated that only someone with those credentials could take it. After that, Ian waited and hoped the job would be there when he was called in to select his new school.

Since Ian had already taught one full year in the district, the selection process was slightly different than the first time around. He was asked to come to a meeting at the human resources building at a certain time to choose his new school in the middle of July Ian found Jack's description to be accurate—the selection room was a chaotic mass meeting. At the meeting, everyone received a list of the available positions in the district. They were told to rank their choices so that they would be prepared as soon as they were called. Strangely, the position that had been written for Ian was not on the list and the remaining choices were not exactly what Ian was looking for.

Jack, Ian's friend, who had already been teaching at City High School, had to choose again too. Similar to Ian, Jack had been assigned to City High School for a one-year term, but he was unaware that he would need to choose again until he was called a few days before the meeting. For some reason, Jack was called in to select his school before Ian and took the job that had been written specifically for Ian. In a moment of panic just before the meeting started, Ian called the vice principal and told her about the situation. She reassured Ian that she would take care of the situation, but as Ian sat with fifty other wide-eyed educators in the large meeting room, her guarantee seemed unlikely. When Ian was called up, he approached the woman in charge and told her his name. At that very moment, she stood up and announced an addition to the list at City High School, which Ian immediately selected.

Luckily, Ian had contacts at City High School that enabled him to get the position, albeit in a complex and stressful way. Others at the meeting, however, did not have the same fortuitous experience. Ian noticed that the elementary teachers were completely overwhelmed when they were forced to choose a school—they were given no other description about the schools except for their addresses. Ian described the meeting as follows:

> The tension in the room was like a giant mousetrap ready to snap as each position was selected and taken off the list. The woman at the front of the room yelled out what to cross off. Then you heard the moans of the teachers as their number one choice was taken out from under them. I have no idea how the order of people was created—there must have been 60 people there and each had a story they wanted someone to hear. Another teacher from Leach Learning Academy was there and she was still there waiting after I had selected—she could have been there until dinnertime for all I know. I was lucky I guess in that I was called relatively early on but who knows why. As far as I could tell we all had the same seniority but maybe they used our old interview score again. All I know is that I am glad that I had people helping me on the outside. Also, I think I must have been one of the only physics teachers in the room. (Ian, interview transcription, 9/15/04)

The saga continues

Ian's story in navigating the hiring process indicates the amount of stamina and motivation that one may need to actually get a position in a large urban district. Throughout the process, Ian felt alone and confused. As if once was not enough, he was forced to expeirence the selection process a second time and found it had become no less draining. Although the interview and hiring process for any job can be frustrating, the logistical problems riddled throughout Ian's experiences made for rough transitions into his first and second years of teaching. Such debacles in hiring and school selection are far removed from the more personal challenges that teachers encounter in urban classrooms, however, they are still a major deterrent for educators who hope to find a position in an urban school. Not mentioned in this story are problems that Ian and his colleagues encountered with payroll, induction, and insurance, all of which reiterated the general lack of efficiency within the system. In the end, Ian often felt that he was not treated as a professional. Ultimately, the inconsistency in the district processes further complicates the lives of teachers who want to make a difference. Nevertheless, after a lot of hard work and perseverance, Ian was placed at City High School—the school of his choice.

Many of the beginning teachers that Ian met had similar stories about their hiring debacles. However, little research has been done that chronicles hiring stories such as Ian's. Throughout our discussions and in analyzing the data for this chapter, we wondered how many teachers might have abandoned their interest to work in large urban districts after encountering such roadblocks. Interestingly, Ian's experiences within the hiring structures at the district level became an important preface to the structural changes he would find in his first year of teaching at Leach Learning Academy.

5 The first year

The first year of teaching can be intimidating and overwhelming regardless of the quality of one's teacher preparation. Luckily, Ian had experienced several rich transitions into teaching, such as the coteaching experience and the curriculum development project, which we described in previous chapters. This chapter aims to describe Ian's first year as a full-time teacher and bring to light some of the challenges he faced given the structural changes he encountered at an urban school that was highly distinct from City High, where he had done his student teaching. We also elucidate the ways in which Ian was able to find success during his first year of teaching by restructuring the classroom to meet his needs, by building trusting relationships with students that bridged differences and by infusing science teaching methods and activities in his math class.

Challenges in the first year of teaching

The literature devoted to studies of first year teachers generally highlights nega-negative experiences, with a few exceptions. The majority of this research is qualitative; "these studies have 'put a face' on the first year teacher, and helped illustrate the interplay between personal background, context, and individuals' goal-directed thought and behavior as they engage in the process of professional induction" (Herbert & Worthy, 2001, p. 898). Some of the themes that occur with relative consistency in studies that explore the first year teaching experience or induction period include arduous workloads without much formal aid, a feeling of "reality shock" as one come to grips with extensive responsibilities, difficulty planning lessons, struggles with classroom management and discipline issues, minimal support from colleagues, and a lack of formal feedback or evaluation. Collectively, such issues may cause new teachers to feel ineffective and insecure. In addition to such classroom-related issues, new teachers struggle with

"entering and maneuvering the social and political system of the school" (Herbert & Worthy, 2001, p. 898).

The student teaching experience can exacerbate such issues and challenges. According to Lawson (1989), student teaching is a "mediated entry" into teaching. Student teachers are generally removed from the politics of the school because of their status as "visitors." Frequently, they are not required to assume all of the responsibilities required in teaching. Consequently, the student teaching experience can lead to an "unrealistic optimism" (Herbert & Worthy, 2001) in which new teachers enter their first year feeling overly confident. When challenges arise, first year teachers may experience reality shock and can quickly become overwhelmed (Veenman, 1984; Farrell, 2003).

Beginning teachers need support from administrators and other experienced educators (Tillman, 2003). Additionally, administrators should organize other support structures for new teachers within the school or district. Tillman (2003) suggests that administrators could help reduce the sense of isolation felt by new teachers if they scheduled time to meet with them throughout the year to talk about issues such as their expectations, teaching efficacy, classroom management, and also to help socialize them into the school culture. Principals should not ignore the power differential inherent in their interactions with new teachers; they should welcome new teachers and make attempts to make them feel comfortable before offering suggestions. Weiss (1999) suggests that the school culture new teachers encounter greatly affects their commitment and willingness to continue teaching. A school culture that promotes support for new teachers and shared governance in decision-making can serve to foster long-term commitment and is highly important in positively shaping the induction experience.

New teachers in urban schools encounter additional issues and challenges (Tobin, 2000). In Tobin's autobiographical analysis, he endeavored to teach chemistry at a high school in Philadelphia in an effort to better align his science methods course with the needs of preservice teachers who were preparing for careers in urban schools. He found that the methods he had used in middle class, predominantly White science classrooms were not effective in his inner city classroom. Additionally, he became aware of the idealism in prescribing that his students use hands-on activities, field trips, and an inquiry-based curriculum; his attempts to use such methods and teach in a manner that was grounded in theory and research was less than successful at City High School. He explained the valuable implications for future teachers that emerged as a result of his experience:

> Every day I enacted activities that I expected to be successful, but they fell short of my expectations and eluded the students' interests. It is imperative that I communicate these findings to student teachers because they should not feel that the research and theory they read necessarily applies in all contexts. It is critical that prospective teachers understand the significance of elements of social class (especially poverty) and ethnic diversity as factors that will shape enacted curricula, the participation of students and what teachers can accomplish. (Tobin, 2000, p. 101)

The use of "orthodox forms of science" caused Tobin to flounder with his inner city students. He realized that he had to reexamine the teaching and learning of science in urban schools and explore the classroom structures that precluded his success as well as the students' interests and motivation to learn.

Unlike the literature that sheds a negative light on the induction experience, we frame most of this chapter around Ian's agency and ways in which he accesses and appropriates resources to meet his personal goals. In many ways, we highlight the successes he finds as a first year teacher in an urban high school. However, Ian's story would be incomplete without a rich description of the structural changes he encountered coming to Leach Learning Academy, a smaller urban magnet school, from a comprehensive, neighborhood high school like City High. Thus, the following section sets the context for Ian's experiences. We illustrate some of the policies and organizational structures that make up Leach Learning Academy's school culture as a preface to the discussion of Ian's more specific classroom practices.

Ian's first period class

Although we also describe some of the larger, more systematic structures at Leach Learning Academy, we primarily examined Ian's classroom as a unit of analysis to uncover mesolevel phenomena. To do this, we chose one of Ian's classes to focus on for a closer look at his practices and interactions with students. After discussing it with Beth, Ian himself chose his first period class for the research because of the challenges he felt he would encounter with that particular group of students. From the beginning, he felt that the students in first period lacked motivation and had a variety of backgrounds and experiences with math.

After spending a few weeks observing Ian's classroom, Beth distributed a survey to the students in Ian's first period math class. The students provided information about their gender, race/ethnic background, grade level, years of math taken at the high school level, and whether they had failed math before. There were 15 females and 12 males in the class. Seventy percent claimed to be in the eleventh grade, and the others were twelfth graders. Of the 27 students in the

class at that point in time (all students were present the day of the questionnaire) 52 percent identified themselves as African American, 7 percent identified as White, 15 percent identified as Asian, 12 percent identified as Latino, and (one student 4 precent) identified as West Indian.

The majority of the class had taken either two or three years of math in high school, although we neglected to ask them to clarify whether they were retaking a course they had failed during a previous year. Only two students reported to be in their fourth year of high school math. An overwhelming 37 percent of the students in the class claimed to have failed a math course before in high school. Over the course of my observations the class population changed somewhat; several students were added to the course roster for various reasons.

Doing research with Leach Learning Academy students

During this time, we were fortunate to have two students from Ian's first period class work with us to collect and analyze data. It was important for us to include student researchers in order to make student voice a central aspect of the study. Also, over the course of the summer curriculum project, we had an opportunity to learn first-hand about the power of including students in research. The student researchers' responsibilities included transcribing video- and audiotaped observations and interviews, participating in detailed individual and group interviews, as well as cogenerative dialogues, creating surveys, and viewing, editing and discussing video data from their first period class. They worked approximately five hours a week after school at a rate of $7.50 per hour. Their remuneration was supported by a grant awarded to the Discovering Urban Science (DUS) group.

Beth originally chose the students with Ian's help. On the aforementioned survey that the students completed, an item asked if they were interested in participating in research work. Students who checked "yes" were also asked to write a short paragraph about themselves as well as the days and hours they were available to work. From those who claimed that they were available to work after school, three students were randomly chosen. Tanazia and Anton were both twelfth grade students taking the junior level math class for the second time. Both were African American and 17-years old at the time of the study. Mia was a 17-year-old eleventh grade student taking the course for the first time. After a few weeks, Mia and Anton decided that they would not continue with the research work because of other commitments. Mia was pregnant and Anton found another job where he could work more hours. As a result, we hired Ann, a White, twelfth grade student, who had repeatedly expressed an interest in working with us during the first month of school.

Throughout our work, Ann and Tanazia added their valuable perspectives to our understandings about what was happening in Ian's classroom. However, we realized that their interpretations were based largely on their own lives and experiences. In order to better understand Ann and Tanazia's perspectives, we sought to find out more about them. Since they both enjoyed writing, we gave them a few hours to write autobiographical sketches. In order to narrow the focus of their autobiographies, the girls decided to write specifically about family information, ethnic and religious background, history in school, experiences with teachers, choice of high school, and goals. As a precursor to the analysis of Ian's first year classroom, we provide a few salient details from their autobiographical sketches.

Tanazia

At the time of the study, Tanazia, an African American female, was in her senior year at Leach Learning Academy. Born and raised in Philadelphia, Tanazia lived in the southwest section of the city with her mother and her twin brother, who had dropped out of high school. Tanazia's compassion and respect for others was immediately apparent upon meeting her, despite her quiet demeanor. She often described her plans to work in the film industry and was particularly interested in filmmaking and editing. Tanazia claimed to have only a few good friends, yet was extremely close to her boyfriend Miguel, who worked as a mechanic. In her writing she described her feelings about friendships:

> There was a saying that "With life you should treat it with care or pay the consequences," and the people I grew up with lived around that with no if, ands, or buts. I was raised around a noisy part of Philly, but I got use to it because I had to or just move. As a African-American/Native-American girl in what we call the rough streets I had to always pay attention to those I called my friends, because people had the tendency to turn their backs on you for drugs! (Tanazia, written narrative, 12/29/03)

During the high school selection process in her eighth grade year, Tanazia had selected the creative and performing arts magnet school as her first choice. Her mother, however, listed other high schools on the application that she thought were appropriate for Tanazia, including Leach Learning Academy and two other large, comprehensive high schools. When Tanazia did not get accepted to the creative and performing arts school, she decided on Leach Learning Academy. Ultimately, she claims the decision was optimal:

I think it was the best decision I have ever made, because I met so many diverse people and learned [more] about their cultures than I have ever done in my entire lifetime living in West Philly. This was new territory for me and I loved the experience of having a better understanding of people that I would have never learned in a classroom. Once I was in the school I realized my passion for writing poems and also wanting to go further in my writing by going into film! (Tanazia, written narrative, 12/29/03)

Leach Learning Academy was not only a good choice from a teaching and learning perspective; it also gave Tanazia a more global perspective with regard to different people and different experiences, such as filmmaking. Throughout the year, Tanazia impressed us with her work ethic and interest in the research. Although she struggled in math, she was considered a good student and was accepted to a state college.

Ann

In appearance, Ann was quite different from many Leach Learning Academy students, with pale skin, medium length blonde hair, and bluish-green eyes. Her backpack was always covered with patches and buttons advertising scores of popular rock bands. Ann's other interests pertained to the Internet; at the time of our work together she had a weblog she updated regularly. She also would spend many hours instant-messaging her friends on the computer.

Ann lived with her father, mother, and two siblings. She was raised in Northwood, a predominately White, working-class neighborhood in the Northeast section of Philadelphia. Northwood is known in the Philadelphia area for its high crime rate. Ann described the neighborhood as "a dirty, just plain bad place to live. Everything about it frightened me". She claimed that she often worried about her grandmother's safety because she still lived in the Northwood area of the city (written narrative, 12/29/03). In 1997, Ann's family moved to another section of Northeast Philadelphia. She claimed, "it's not a perfect neighborhood, but it's better than Northwood" (written narrative, 12/29/03). Since her neighborhood was quite far from Leach Learning Academy, her voyage to school on public transportation was approximately an hour long each way.

In reading Ann's narrative, her negative attitude about her K–8 school experience is obvious. By eighth grade, she had attended three different schools.

I never really liked my school life before I got into high school. I hated school from first grade up to about eighth grade. Kids were so immature at that time. Teachers were mean and I didn't have too much fun. The first school I attended was Jones Elementary School in Northwood. I attended Jones from kindergarten to fourth grade. For fifth grade, I went to Catholic school. I still don't know why I attended that school, knowing that I'm not

religious. Then when I moved in 1997, I attended Leslie Elementary School for sixth, seventh and eighth grade. (Ann, written narrative, 12/29/03)

Although Ann shuffled around between several different elementary schools, she attended Leach Learning Academy for all four years of high school. Similar to Tanazia's situation, Ann's high school selection was mediated by her family. She described her experiences in high school quite differently than her earlier school experiences.

When I was choosing high schools, I didn't really know too much about Leach Learning Academy. I applied to Leach Learning Academy, Taft High School, and some other high schools. When I received my acceptance letters, my parents thought Leach Learning Academy would be the best for me. Now, I am in high school and I love it. It's the best thing that ever happened to me in my opinion. People are more mature, there are nice teachers and I have so many friends, especially now in my senior year. I attend Leach Learning Academy high school. My concentration there is art. I want to become an artist and learn how to create many forms of art using computers. I'm not the best student when it comes to school, but I get through it pretty well. This is my last year at Leach Learning Academy. I will miss everyone once I'm out of there. I do plan to attend college to study computer arts. (Ann, written narrative, 12/29/03)

At Leach Learning Academy, Ann developed a love of art. Throughout our worth together, she would often show us her latest piece of artwork. For Ann, high school was a time in which she made new friends and became more confident as an artist. By the end of the year she had also been accepted to a local college and had plans to major in art.

Ann and Tanazia's prior experiences, interests, values, goals, and family lives serve as an important precursor for their attitudes toward math and Ian's class, as well as their as researchers in our project. Unfortunately, they were only able to work on the project for about five months—from October until February of Ian's first year in the classroom. During that time, they added their invaluable perspectives to our data collection and analysis.

Changes in the institutional structure

With the summer curriculum project over and the district hiring process a nightmare of the past, Ian began his first year of teaching at Leach Learning Academy, a small high school in the center region of the city. Even though Leach Learning Academy is less than two miles from the site where Ian did his student teaching, many of the structures within the school are highly distinct

from those of City High School. Unlike City High, which is a large, comprehensive, neighborhood high school, Leach Learning Academy is considered a magnet school because students must apply for admission. During the 2003–2004 school year, Leach Learning Academy had a student population of approximately 800 students in comparison with the 1,800 students at City High. Leach Learning Academy is also much more ethnically and racially diverse than City High. The breakdown is approximately 48 percent African American, 24 percent White, 16 percent Asian, and 11 percent Latino, compared to the population of City High, which was roughly 98 percent African American students.

Leach Learning Academy uses a competency-based system that requires students to master a course before moving on to another one. The philosophy behind the competency-based system is outlined in the school's mission statement, which claims:

> The principles that guide the day-to-day functions of a school should remain vibrant and flexible. They should be a solid foundation, which keeps the institution true to its goals and purposes. [Leach Learning Academy] supports the idea that every student can achieve competence. Students progress at a rate commensurate with ability levels within the guidelines as determined by the teacher. This rate may be faster or slower than one credit per subject per month. We continually work with our students in an attempt to achieve proficiency and success; the student has not failed but only has not yet mastered the subject matter. There is an underlying philosophy of support for the individual—understanding his or her problems, constraints, and goals, and attempting to ameliorate a situation, which can be improved. (Leach Learning Academy web site, 2004)

The mission statement suggests that Leach Learning Academy is an institution that emphasizes a student-centered, understanding atmosphere, which would be directly in line with some of the sentiments expressed in Ian's philosophy. However, the description of Leach Learning Academy's competency-based promotional system contradicts the traditional, Eurocentric ethos that seems to pervade the school. The school building itself is a very old, traditional-looking structure. It encompasses half of a city block and consists of four stories of small classrooms. Each classroom has high ceilings, plaster walls, and old hardwood floors. Although some of the architectural details within the school such as the marble entryway and staircase were quite beautiful, the school was old, musty, and dark.

Because of its designation as a magnet school, Leach Learning Academy is considered by teachers to be one of the more attractive high schools in the district, even though the students' general academic performance is similar to those at many of the city's comprehensive, neighborhood high schools. Students apply

for admission, but acceptance is not based on student achievement. Instead, the school selects students of diverse backgrounds, cultures, ethnicities, and ability levels in an effort to create a microcosm of US society (School Handbook, 2004).

Because of its smaller size and low quantity of discipline issues, Leach Learning Academy is considered by most to be a safe school with a positive atmosphere. However, the school and its students still struggled with many of the challenges typically associated with urban schools, such as teacher turnover, a lack of resources, and according to some teachers' perspectives, questionable leadership.

The credit system

According to the school web site, Leach Learning Academy is the only high school in the school district that uses a competency-based assessment system rather than a traditional grading system. In each class, students are required to demonstrate mastery of the subject matter. They receive one credit for completing a unit of study in a course. After the student has received at least ten credits, he or she can move on to another course. Each course is designed to follow a ten-month time frame. Once the student has progressed through the sequence of required courses by receiving the appropriate amount of credits, he or she can graduate. Theoretically, students can graduate early if they receive their credits and progress quickly through courses.

However, students can also fail to complete a class, even if they have succeeded in receiving some of the required credits. For instance, eight of the twenty-seven students in Ian's first period class had taken the Core Plus Math III course before, yet had received anywhere from only one to eight credits and thus could not pass the class entirely. It was up to Ian to decide what would constitute the remaining credits. Given that each student was on a different timeline and had accomplished a different amount of work, he had to plan differently for each individual. In an interview that took place early in the school year, Ian expressed how the system was a challenge.

Beth:	What have been the things that have really made you overwhelmed?
Ian:	Mostly just the kids that are ahead because I have to come up with stuff way ahead of time.
Beth:	So the kids that failed technically, last year?
Ian:	Yeah, so, and I feel bad, its not really external pressure, its more internal, because I feel like I'm doing a bad job when I don't allow them to move

> ahead faster, because I just don't have the stuff done for them. Like I have kids that say, well, just give me all the stuff to do and I'll do it all, and I believe them, but I really just don't have it done for them. And I just feel bad that I'm not as organized.
> (Ian, interview transcription, 10/06/03)

Because of the structures present at Leach Learning Academy within the competency-based system, Ian was doing much more work than he had expected. By October Ian was planning the requirements for credits that would be applicable to the regular cohort of students (those taking the class for the first time) during the second half of the school year, in an effort to accommodate the students that were ahead.

The students in general felt that the credit system was a difficult structure to maneuver through, especially since they had all come from traditional middle schools. One student, Anton, spoke of the level of responsibility that students need to have at Leach Learning Academy to be successful because of its system.

> I mean [Leach Learning Academy] is a school where if you're not organized you're gonna fail. You have to keep yourself organized. But they give you more responsibility. If you do your work and you get a credit, that's your credit, you have that in your hand. They're not gonna turn it in for you. So its up to you if you're gonna get that credit or not. You have to work hard for that credit. It's more like a race. (Anton, cogenerative dialogue, video transcription, 10/28/03)

Ian also discussed some of the contradictions between Leach Learning Academy's educational approach and his students' prior experiences in school.

> I'd say that on some levels that school had a different approach—I wouldn't call it an urban approach—but I would call it a different approach, I mean with the whole credit system and everything. And some teachers subscribed to that more than others, some would teach in a traditional way, and some didn't. It was up to you, which made it strange, because students had to negotiate different styles and expectations in every class. But in terms of the way the school is run, it's very traditional. (Ian, interview transcription, 6/7/05)

In essence, Ian also found the credit system to be a challenge, especially from an instructional planning standpoint. He also found it strange that many teachers at Leach Learning Academy still taught in a traditional manner, even though the school philosophy and the credit system were more in line with differentiated, student-centered, and project-based approaches.

Standardized testing pressure

In his first interview at Leach Learning Academy, which took place after he was hired, Ian learned that the school was receiving pressure from the district because of its low scores on the state-mandated standardized assessment. The Pennsylvania Department of Education describes the statewide standardized test as follows:

> The annual Pennsylvania System of School Assessment (PSSA) is a standards-based criterion-referenced assessment used to measure a student's attainment of the academic standards while also determining the degree to which school programs enable students to attain proficiency of the standards. Every Pennsylvania student in 5th, 8th and 11th grade is assessed in reading and math, and students in grades 6, 9 and 11 are assessed in writing. Individual student scores, provided only to their respective schools, can be used to assist teachers in identifying students who may be in need of additional educational opportunities, and school scores provide information to schools and districts for curriculum and instruction improvement discussions and planning. (http://www.pde.state.pa.us/a_and_t/site/default.asp)

On the standardized test, students score within a range of levels and receive score of advanced, proficient, basic or below basic. In Philadelphia, the scores have become a benchmark for school performance; the district uses the scores to evaluate individual schools.

In his entrance interview, Ian was told that one of his objectives as an eleventh grade math teacher would be to help students improve their scores on the exam. During the 2002–2003 school year an overwhelming 76 percent of the eleventh grade students tested below the proficient level on the math portion of the exam. Only 6 percent of students received an advanced score and 18 percent scored proficient. This was an increase from the 2001–2002 school year, when only 15 percent of students received proficient or advanced and 85 percent received basic or below basic. In an effort to combat the problem, many of the objectives stated in Leach Learning Academy's explicit Action Plan (pp. 20–32 School Improvement Plan document,) were devoted to helping students on the math portion of the assessment. For example, the document suggests that teachers' instructional strategies should focus on "integrating the use of [Pennsylvania System of School Assessment] and Terra Nova [another district sanctioned assessment] preparation into the daily routine" (p. 22).

Leach Learning Academy's standardized testing concerns had created a culture of testing with the school. According to Ian, a lot of the discussion at faculty meetings revolved around strategies for improving student performance.

Ian's classroom had a set of standardized assessment review books that Ian used regularly with his students. However, toward the middle of the year, the school district mandated that math teachers incorporate more formal standardized assessment practice into the daily routine. Ian felt that every activity in his class helped students prepare for the test, however as a result of the school district's directive, the principal wanted to see the students doing even more traditional "skill and drill" work with the standardized assessment review workbooks than normal. Because of this mandate, Ian had to change some of the class activities that the students found most engaging, such as the extensive minilabs and other hands-on projects he had incorporated. The directive to spend extensive time reviewing with the workbook problems was also in direct contradiction to other statements made by the principal throughout the year, in which he encouraged teachers to engage students in creative lessons and to decrease the use of worksheets. Essentially, the review materials were a collection of worksheets.

During a postobservation conference that the principal had scheduled with Ian, the discussion turned to strategies for improving his students' standardized test scores. He suggested that Ian identify a small group of students that he felt he would be able to "coach" to improve their scores enough for a significant change in the school's overall statistics. Rather than focusing on all the students in his classes, Ian should spend the majority of his time working with those that had a strong probability of moving over the hump—from a basic to a proficient score. This way, the school could control for at least a small overall improvement. Even though Ian seemed anxious about the students' performance on the upcoming test, he chose to remain faithful to his philosophy of working individually with every student in the class, regardless of his or her aptitude or odds of moving up a level. He set aside some time to use the review workbooks, but he continued to involve students in creative, hands-on activities to help them better understand mathematics.

Core Plus Mathematics

Rather than following a traditional sequence of math courses such as algebra, geometry, trigonometry, and calculus, Leach Learning Academy had adopted Core Plus Mathematics, an integrated, problem-based mathematics program. According to the McGraw-Hill (1999) *Core Plus Mathematics* textbook, the program is described as follows.

> The *Core Plus Mathematics Program* is a multi-year project funded by the NSF to develop student and teacher materials for a complete high school mathematics curriculum. Courses 1–3 comprise a core curriculum appropriate for all students. . . . The curriculum

builds on the theme of mathematics as sense making. Investigations of real-life concepts lead to discovery of important mathematics that make sense to students and, in turn enable them to make sense out of new situations and problems. (p. xiii)

Although Ian agreed generally with the integrated philosophy behind the Core Plus program, he felt that it presented some unique challenges for his students.

I think Core Plus, in theory, is really good. But I think it needs more supplemental problems. It also throws too much at the kids at once. It's too all over the place. It needs to be easier at certain times and harder at other times. Like, it'll throw out a problem and then it'll say in the teacher's guide that students should not be expected to complete this problem or they'll get an answer and it'll be wrong. And for me, that's fine. But for the kids, it's frustrating, because they're not used to that kind of thing. The kids hated it, so I avoided it. I technically was supposed to be doing standardized testing review, so I didn't really follow the [Core Plus] book. There was no curriculum framework for me to use. At math meetings we would talk sometimes about what we should cover, but very loosely. Core Plus is the kind of thing that claims to be a lot of activities, hands-on, but really comes down to a lot of reading for them. Like the problems have ten problems, and then at the end, the kids are supposed to understand a new theory or a new topic. I guess you can call it inductive reasoning. So they have to figure it out as they go through. But the problem is when they don't have that base knowledge—they get caught a lot easier because it's hard for them to struggle. Because they haven't had success in the past—they haven't had success with math. So then they're struggling with it, they just give up. That's one of the problems with [another teacher], he just keeps saying, "You have to figure it out," and he's following what the curriculum says to do, but when the students have a negative view of the situation and to begin with, they're not really interested in spending an hour on a problem. So it's difficult for them. (Ian, interview transcription, 6/7/04)

As Ian mentioned in the quotation above, the students complained that the program had several drawbacks, especially in light of the demands of the school's competency-based system. According to Anton, one of Ian's twelfth grade students, the combination of the innovative program and ineffective teachers served to turn him off from math:

I mean, Core Plus Math, when I first started, I said, "Oh my god, we get to use these cool new calculators!" Two weeks later I was like, "Oh my god, we get to use these stupid calculators." You know. Give us a problem that we can do. And we had teachers back then that didn't even care about us, that couldn't communicate. (Anton, cogenerative dialogue, video transcription, 10/28/03)

Kayla, another of Ian's twelfth grade students, also worried that she had grown to dislike math because of the Core Plus program and Leach Learning Academy's competency-based system. During a cogenerative dialogue involving Kayla, Anton, and Tanazia, each commented on the issues inherent in Leach Learning Academy's math program and the structure of the credit system:

Kayla:	I don't think its good, the math system at [Leach Learning Academy]. I had pre-algebra in seventh grade and Algebra I in eighth grade. I felt good in eighth grade, like my middle school. I did very good. I was always on honor roll.
Tanazia:	Same here.
Kayla:	No, like (Leach Learning Academy) made me lazy in math.
Tanazia:	Exactly. Like you work at your own pace.
Anton:	Yeah, that's true.
Kayla:	When I was in middle school, it's not because the work is easier, I think it's the same. It's the same work.
Beth:	So you think it's the structure of how it's set up at [Leach Learning Academy]?
Kayla:	Um hmm. I think its because we have credits. That's why.
Tanazia:	It's different because we came from a background of getting grades.
Anton:	Yeah, we get grades, and then we move on to credits. I mean it's been explained, but they don't really go into detail with stuff.
	(Cogenerative dialogue, video transcription, 10/28/03)

In essence, it seemed that the students had complaints about the ambiguity of the Core Plus program, which were exacerbated by the credit system. Both Kayla and Tanazia claimed that they had begun struggling in math when they came to Leach Learning Academy, even though they previously considered themselves to be good math students.

One of the aspects of the text-based program that Ian used to his advantage was the broad range of concepts to be covered in the Core Plus program; he could basically choose what he wanted to cover, especially since there was no formally written school or district-wide curriculum for his class. During the first week of school, Ian gave the students a diagnostic assessment so he could evaluate their knowledge of basic math concepts and then develop lessons according to their needs. In a short, whole-class cogenerative dialogue, Ian explained to the students his plan for incorporating various types of math into the course and reviewing some of the concepts that the students found problematic: "what my plan is, so you guys know, is to try to get all these things that I feel like probably didn't get covered well enough in the past" (Ian, video transcription, 11/10/03).

A few months into the school year, Ian learned that the Core Plus system was being phased out. The incoming students next year would be following a traditional curricular sequence in mathematics that would be standardized across all of the district's high schools. Thus, Ian had little motivation to get to know the program fully and implement it entirely in his classroom.

Missing support

One of the greatest transitions Ian faced was moving away from the collaborative reflection and support that was integral to his coteaching partnership with Jack. The sense of isolation felt by many first year teachers was compounded for Ian because of the collaborative nature of Ian's coteaching arrangement. After his first month at Leach Learning Academy, he remarked on one of the drawbacks of teaching by himself.

> Oh yeah, we were always talking. That's what I miss. Here I don't have anyone. You don't have anyone saying well, what could we have done better. Because the kids don't know—they're just doing it. And then other teachers that come in just to watch, they don't know what I'm trying to do. Whereas Jack and I were like, we want to get them to do such and such and then we would say, hold on, maybe we need to change that. And that, that's the thing. That's the issue, really. (Ian, interview transcription, 10/21/04)

Ian's journal entries also suggested that he missed having Jack to coteach, coplan, and collaborate with in general.

> I miss Jack often when I am doing work by myself with no one to bounce ideas off of. I don't feel uncomfortable teaching without him here but when it is prep time or after school it is boring. It is true that teaching is lonely. Plus the only feedback I get is from students, which I appreciate but is not all I need. It's good to discuss the class as it ends with a peer. (Ian, journal entry, 10/17/03)

Even though the school district had implemented a new program that paired every new teacher with a job coach, Ian still felt isolated and had little opportunity for reflection with others. His job coach, an experienced teacher mentor that floated between different schools, met with Ian and other science and math teachers monthly for a seminar-like meeting. He also came and observed Ian twice during the school year. However, the minimal support he received from the job coach was much different than his experience during coteaching. With Jack, Ian was able to constantly assess his practices by *being in/with* the classroom with Jack and others and by participating in the numerous opportunities for collaborative inquiry on his own practice. At Leach Learning Academy, Ian

felt that he had stepped into a new world in which amassing strategies for improving standardized test scores was valued more than supporting beginning teachers.

Missing community

At City High School, Ian had grown accustomed to the sense of community that was established because of their small learning communities. At City High, each small learning community, which was made up of approximately 300 students and ten teachers, focused on an interdisciplinary theme. Ian found that one of the greatest resources that emerged from this organization was the presence of a small learning community coordinator, an administrator specifically designated to a group of students and teachers in each small learning community. The coordinator in Ian's learning community at City High performed teacher evaluations and often talked to Ian and Jack about ways they could enhance their teaching. If discipline problems arose, Ian could send students to the coordinator, who actually knew the students, rather than one of the vice principals or deans.

Leach Learning Academy was also organized into small learning communities, which they referred to as "mini-schools." Interestingly, students often seemed to take classes outside of their communities, which made the organization somewhat arbitrary. Leach Learning Academy was not set up spatially in accordance with a teacher's minischool, which also made the organization seem unnatural. Additionally, at Leach Learning Academy, Ian was unsure of the coordinator's role, and how he could utilize this individual as a resource:

> Well, Carol, my small learning community coordinator at City High had a lot of ideas about specifically our class that Jack and I were doing. And the kids all knew her and she would come around. Basically, she supported us. I could send a student to her hypothetically whenever I wanted to and she would deal with it. I think I could probably do that here, but I don't know, I mean, that is supposed to be how it works, but the chances of [the coordinator at Leach Learning Academy] being there are slim. Well, Carol was always in her office—she was always centralized around there. And I felt more comfortable sending kids to her knowing that she would be there and she would deal with it. Whereas here, I feel like if I sent a kid down to see the guy here, he might not be there. It's not like he's supposed to be, but, I just feel like there's some variations there. And he might not even know the kid. (Ian, interview transcription, 10/04/03)

Ian felt that there was less of a sense of community at Leach Learning Academy because of the challenges inherent in their distinct minischool structure. He also missed the support he felt he got from Carol, his coordinator at City High.

There isn't the strong small learning community or team or whatever you want to call it. I mean they have them but they don't really mean anything here. Whereas, at [City High School], with Carol, there was an obvious next step. She knew all the kids and it was more of a community. (Ian, Interview transcription, 10/04/03)

At Leach Learning Academy, Ian was also instructed to go to the coordinator with problems, but did not necessarily feel comfortable doing that: "the coordinator, I mean, he's who I go to obviously, but there isn't just that sense of togetherness." Oddly, Leach Learning Academy had a department head for math; however, none of the other departments had a chairperson.

Ian: The math department is the only department that has a department head here. Like there's no history department head, there's only math.
Beth: Hmm. I wonder why?
Ian: I don't know. Well traditionally, math has been a problem area here, so that's what I assume.
(Ian, interview transcription, 10/04/03)

Ian received little guidance or support from the math department chair. Thus, even though there was more human capital at Leach Learning Academy, because of the structure of their organizational system and the questionable roles held by the individuals in leadership roles, Ian was unable to use the coordinator and department chair as resources. Whereas he felt comfortable asking the coordinator at City High for help and was physically close in proximity to her office, both the coordinator and department head at Leach Learning Academy were physically farther away from Ian's classroom. Also, at Leach Learning Academy both the math department chairperson and the small learning community coordinator spent the majority of the day teaching classes, so in the event that Ian wanted to stop by to see them with a question or concern, the probability that they were teaching was high.

Ian's agency in unfolding, dynamic structures

Even though the institutional structures that emerged at Leach Learning Academy were quite different than those Ian had encountered at City High, he had many opportunities to exert his agency and take ownership of his classroom as a teacher. Thus, the structures Ian encountered at Leach Learning Academy actually supported his practices in two specific ways.

First, Ian had no one monitoring his work, so he was essentially free to structure his classroom as he wished. Although he had to hand in basic, monthly

unit plans, he had a significant amount of freedom to structure his lessons. Within each unit, he was able to spend a large portion of instructional time doing project-based math activities or labs. He was also able to work with students one-on-one or in small groups. We elaborate further on these aspects of Ian's teaching style and their implications in the sections that follow.

Second, because of the ambiguity of the eleventh-grade math curriculum and the phasing out of the Core Plus Mathematics program, Ian could incorporate many physics-based activities into the course. Many of the activities he used were adapted from labs and demonstrations that he and Jack had created for their engineering physics class, which showed that Ian was able to access and appropriate resources in new, creative ways—ways that were still conducive to meeting his objectives in the eleventh grade math course. We describe some of the ways in which Ian taught math in a science way in chapter six.

Building social capital with students

Even though some of the structural changes Ian experienced in his transition to Leach Learning Academy emerged as challenges, he had considerable freedom to pursue his own agenda. Because of this freedom, Ian felt as though he could incorporate his own goals and interests into the classroom, such as building relationships with students. We discuss Ian's actions theoretically using Bourdieu's (1986) construct of *social capital*, which he describes generally as "social network." Ian believed he could build relationships with his students that eventually would grant him some social capital with them—capital he could exchange for students' involvement in classroom learning activities. In this section we detail three ways in which Ian sought to build social capital with students: at the beginning of the class period during the initial pre-class or warm-up activity, through cogenerative dialogues, and in other situations in which Ian served as an advisor or counselor to students.

The pre-class problem: A time for tutoring

He teaches openly, he gives us a lesson, and while we're doing the lesson, he comes around individually and asks us what do we need help on from the work we're doing right now, or the work behind. (Anton, video transcription, 10/28/03)

Every time I turn around, I see Mister Stith at a different desk. He is always helping someone. Even if people don't ask for help, he will go around and ask if they are okay and if they understand. If everyone finishes the worksheet, he may go over the answers. (Ann, journal entry, 2/4/04)

(Mister Stith) always all over me! (Larry, video transcription, 2/24/04)

In addition to the daily activities, Ian's classroom routine involved a pre-class or warm-up problem written on the board that the students would begin immediately upon entering the classroom. The activity was highly reminiscent of Ian and Jack's work together in the engineering physics class; they too gave students a daily pre-class assignment. It was clear that this was one of the practices that had transferred over to Ian's work at Leach Learning Academy, in spite of the many changes in structure he experienced.

Rather than checking homework, taking attendance, or performing other administrative tasks during the pre-class assignment, Ian took the opportunity during this time to work individually or in small groups with students. He would often allow the pre-class activity to run longer than expected—it would sometimes last close to fifteen minutes. During this time, however, he was able to talk to a large percentage of the class about the problem and address any difficulties the students were having. Individual students would ask questions or ask for clarification on the problem at hand. At this point, Ian could differentiate his instruction based on the students' needs. He could also review student work as it was being performed, rather than after, when input would be of less importance to the students. Even though his first period class had twenty-seven students, most students grew accustomed to receiving highly individualized attention from Ian. Some students started to refer to this time as his "tutoring sessions."

According to Anton, a twelfth-grade student in Ian's first period class, everyone was a target for Ian's tutoring, not just those who asked for help:

> And the people that are interested he go to, and the people that's not interested—he still go to anyway. He don't take them out of his circle of learning. He gets involved with students who want to learn, he also helps students who don't want to get involved. (Anton, video transcription, 10/28/03)

Ian's pre-class tutoring served several purposes. In addition to helping students who specifically requested it, he was also able to refocus the attention of students who were off-task or distracted. This was often the case with a group of female students in the back of the room. At the beginning of the period, it would take them a while to get out their materials and begin the pre-class assignment. They all appeared to be friends and would take the first few minutes of Ian's class to catch up and chat about anything but math. Several of the girls brought their breakfast to class and would eat rather than beginning their work. Frequently, Ian would go over and sit in an empty desk close to the group and help to refocus the girls' attention to the pre-class activity.

Ian's tutoring work did not end upon the completion of the pre-class activity. When the students were working in groups or individually at other points during the period, Ian was always circulating. It was clear that students felt very comfortable asking him questions and working with him one-on-one based on the constant "Mister Stith!" that was called out in the room. Interestingly, Ian's practices in this domain mimicked those that became prevalent during his stu-student teaching experience. The video data showed that Ian spent most of the period circulating and working with students individually, as he had often done while coteaching with Jack.

Theoretically, two salient points emerge from Ian's penchant for working with student individually or in small groups. First, the students began to recognize Ian as a resource who fostered their individual agency—they could easily employ Ian as a resource to better understand a concept or for help with problem. Second, the students began to recognize Ian as a teacher who cared about them and deserved their respect. He had also built interpersonal relationships with many students, which made them feel comfortable engaging in one-on-one interactions with him.

Helping students individually or in small groups during class seems like a task that would be intuitive to any teacher. However, at Leach Learning Academy, many students spoke about other teachers unlike Ian who would refuse to respond to their needs for help. During one impromptu interview with a small group of female students, Anita, Kim, and Pilar talked about a significant difference between Ian's class and that of their previous math teacher:

Anita:	Last year I had Mister Boston and I was struggling in that class. He was not helping me, he was always up at the board. Mister Stith, he come over and help us.
Kim:	Mrs. Perry don't help you at all. She'll just be like oh well, let you do it yourself.
Beth:	Is it important for a teacher to help in a math class?
Pilar:	Yeah–
Kim:	Especially when you don't get it.
Anita:	When we asked Mrs. Perry for help, she said you should know it and she gave us an attitude when we asked her to help us. But Mister Stith don't get no attitude.
	(Interview transcription, 11/10/03)

Ian was able to build bridges with students that resulted in social capital by simply being open to their questions and by being willing to help them work through problems. Several students in one of Ian's cogenerative dialogues

mentioned his practice of circulating to help students individually as an effective class structure:

Ian: Well what do you think makes (other math teachers at Leach Learning Academy) good or bad?
Rob: The way they teach.
Larry: If I fall asleep in class. And if I say I don't understand it, and they still can't teach me, that's not good.
Rob: Most teachers when you ask for help won't help you anyway. Like, take Mister McNeill, for example, if I ask him to go over something, he'll say, "no I already explained it. It's too late." I'm like, "What? You're supposed to be teaching me!"
Dana: You'll get your credits in (Mister McNeill's) class, but you won't learn anything.
Rob: Yeah, exactly, because for work we have these packets right, and you can just write down anything, he doesn't check it, so you can write down anything and give it to him and you get a credit.
Beth: So how's (Mister Stith's) class different?
Larry: (Mister Stith) always all over me! ((*Everyone laughs*))
Martin: Yeah, he makes sure you do it.
Ian: Well, to me, like in my own head, that's what I should do.
Martin: Yeah.
John: Yeah.
Larry: Yeah, you gotta be on me, if you want me to do my work.
Ian: But, does that work you think, like I know for you guys in general it works for, but do you see some people that it doesn't work for, are there people that still say "I don't know anything"?
John: No, they try more if you try more.
(Video transcription, 2/24/04)

In the transcript above, the students gave constructive criticism of Ian's practices and contrasted his teaching with other math teachers at Leach Learning Academy. Rob expressed a concern that was reiterated by several other students throughout our research, that many teachers "won't help you anyway." Rob indicated that other teachers he had experienced would only explain things once. If students did not understand, they were on their own. In contrast, Ian would sometimes explain a concept several times, even if it meant repeating himself. Also, the students indicated that in Ian's class, they actually learned mathematics. In other classes, they were subjected to meaningless busy work; by completing packets of worksheets, they did not learn the material completely. In Ian's class, however, they felt like they came to understand the material. His

constant presence and one-on-one help enabled the students to complete the activities and learn the concepts, even when they were not motivated. The last statement in the transcript, made by John, indicates that the students were willing to work hard as long as the teacher reciprocated their efforts. Since Ian worked hard to help his students, the students were also willing to try.

In an in-depth interview, Ian talked about his rationale for working with students individually or in small groups. Beth had asked, "What was your reasoning for working with students so much individually?"

> Well, the beginning of the school year, I tried to get an idea of where everyone was, and we talked a lot about past math classes and what they liked and didn't like. I guess I didn't realize that everyone was so all over the place and that they really needed individual attention. And that's sort of what they wanted, too. Then at some point, I would rationalize it in some ways. I had an argument with my teacher coach about it. He would say that I needed to get up and front and tell everyone this and that—so he was telling me I was doing it the wrong way. So my opinion was, my rationale was, when I stand in front of the room, even with a great teacher, some of the kids aren't paying attention (laughs)—even if they look like they are. And I'm not a great lecturer—I know it's not my strength. So it's going to be just as effective and take the same amount of time if I explain it to each group than if I just repeated it six times in front of the room. It didn't really seem like I was wasting time because if went around to the groups and said, "You guys need to do this," it's more personalized and then they're saying, "help me". Instead of the whole class—who may or may not need it. So it came from that. The kids *wanted* the individual help. I don't think they got it in other classes—that was the impression I got. (Ian, interview transcription, 6/7/05)

The transcription above shows that Ian was able to assess his students' knowledge at the beginning of the year so that he could differentiate instruction based on their particular needs. He also indicates throughout that he listened to and tried hard to read the students—he mentioned twice that the students wanted individual or help or instruction. Even though his job coach disapproved of this strategy, Ian continued to work with students in a one-on-one or small-group capacity because it suited both his pedagogical style and the students' needs.

On the whole, Ian successfully transferred one of his practices from the student teaching field to that of Leach Learning Academy: he was able to effectively work with students one-on-one to ensure their understanding of concepts. By working with students individually or in small groups, he could get to know their strengths and weaknesses in math and help them better understand the concepts in the course. By showing students that he cared about their success on an individual level, he was able to build social capital with them. Despite the

constraints of first year teaching, Ian's work with students in this manner had become an intuitive, almost unconscious practice, yet it still strayed from the norm of other teachers at Leach Learning Academy.

Cogenerative dialogue: Respecting and incorporating student voice

Today we had a cogenerative dialogue after school with four of Ian's students, two of which were in his first period class that I normally observe (Larry and Cindy) and two from other classes. Even though the kids weren't in the same class, they were all in Ian's Core Plus III classes, which he generally structures the same every period. Most of the understandings that were reached through the cogenerative dialogue involved the class routines, which were similar regardless of the period. One of the most interesting comments the students made was in regard to the cogenerative dialogue itself: "Just the fact that you're doing this. No other teacher here [at Leach Learning Academy] would ask us for our opinions about class." (Beth, field notes, 2/24/04)

Among the many benefits that came from Ian's use of cogenerative dialogue was the level of respect the students felt in having their voices heard. Also, it became apparent that soliciting feedback about teaching and learning and listening to the students' perspectives were not the norm at Leach Learning Academy; the students were quite surprised that Ian would be interested in their opinions. Yet because of Ian's success in using cogenerative dialogues during coteaching and his experience in incorporating student voice into the curriculum and lesson planning process, Ian was exciting to incorporate these practices into his work at Leach Learning Academy. Ian realized that through the use of cogenerative dialogue, he could empower his students to contribute democratically to the class and help him come to new understandings about teaching and learning mathematics.

Because of Ian's hectic schedule as a first year teacher, we only had a few opportunities to initiate and organize formal cogenerative dialogues after school at Leach Learning Academy. However, each cogenerative dialogue was full of insights about the nuts and bolts of the class and helped all of the participants generate new understandings and plans for action that would enhance the classroom structure. For instance, at the first cogenerative dialogue, we talked extensively about the physical arrangement of the classroom, particularly the way that Ian had clustered the desks into groups. Kia, one of the students, also talked about the general messiness of Ian's classroom—there were several tables and file cabinets in the back of the room that were not being used, yet took up a lot of space. Kia shared that this was not a particularly effective use of space, which the students (and even Ian) agreed with. The students also claimed that the

physical structure of the class often made it hard for them to pay attention. At times it was advantageous for the desks to be in assembled into groups, for instance, for cooperative, problem-solving activities, but when Ian was explaining something at the board or doing a demonstration, they found it easy to get distracted, especially since some desks faced the back of the room.

The first cogenerative dialogue led to a small, yet significant transformation in the classroom. The students decided that they would help Ian move the desks in different configurations, depending on what types of activities they would be doing. The following day, Ian had changed the desks into "U" formation because he was lecturing for part of the period. Also, he made it clear that students could move their desks as they wished, for instance, if they could not see or if they wanted to work collaboratively with someone else. For the remainder of the year, Ian would arrange the desks in different formations, depending on the lesson. Ian also moved some of the extra furniture to the back of room to give the students more space. As a result of Kia's comments, he hung up student-created posters to make the room more aesthetically pleasing and inviting.

Even though altering the physical structure of the class may seem like a minor understanding to emerge from a cogenerative dialogue, the change enabled the students to work more efficiently and without distractions. In addition, the students were validated when they saw the understandings they cogenerated in the dialogue come to fruition immediately when they walked into the classroom the next day. Thus, the change in the physical structure in the classroom served to authenticate student voice, which in turn helped Ian to build social capital, or bridges with the students who had participated in the cogenerative dialogue.

Mister Stith helps me out

In another cogenerative dialogue, the conversation focused on teacher caring. As the discussion evolved, it became clear that the students believed they could easily distinguish between the teachers at Leach Learning Academy who cared about them and those who did not. In one part of the dialogue, Larry claimed that he had not heard anyone express a dislike for Ian:

Larry:	I don't hear no students say "I hate Mister Stith."
Ian:	Well I guess not hate. I hope they don't hate me! ((*Laughs*))
Larry:	No, like, I don't hear students say, "I really don't like him."
	(Cogenerative dialogue, video transcription, 2/24/04)

In the context of this conversation, Larry distinguished between other teachers at Leach Learning Academy that students claimed, "to hate." Larry had never

heard other students speak negatively about Ian; this suggested that most students (according to Larry) thought favorably of him.

One of the reasons the students may have grown to respect Ian was his interest in inquiring about the students' lives outside of the classroom and in building relationships with them. Based on the students' comments, it seemed that other teachers at Leach Learning Academy spent little time developing rapport with students. In contrast, students expressed their comfort with talking to Ian about issues unrelated to school.

Larry: Sometimes, sometimes, if students don't be stable or in their right mind, Mister Stith be like "what's wrong?" and stuff–
Martin: Yeah.
Larry: If students be stressed, sometimes they be about to kill somebody. And some other teachers' be like, "I don't care, get to work."
(Cogenerative dialogue, video transcription, 2/24/04)

In this interaction, Larry described Ian's practices (the action of asking a troubled student, "What's wrong?") in contrast to other teachers who might worry about students' personal lives distracting from instructional time. To Larry, this was very important, since for some students, disengagement or a lack of motivation may signify that something serious is wrong ("sometimes they be about to kill somebody"). Because of such practices, Larry felt that he could trust Ian, and that Ian was deserving of his respect.

Tanazia also described the power of Ian's help when she and her boyfriend got into a car accident:

Mister Stith already saw something was wrong because of my long face. He asked me what was wrong and I told him, "Oh something that happened yesterday," then he asked, "is it anything you want to talk about?" and I said yeah so he sat down before class started and said what's wrong? I told Mister Stith that my boyfriend and I were a part of a car accident, and he asked right away, after I told him, if I was all right. I said yes and that we weren't sure if the people we hit were okay. Then he asked if there was any major damage and I told him no. He tried to comfort my feelings by saying "they are probably okay, if there wasn't any major damage." After he told me that I felt better, and as he saw it as well he asked if I was going to be okay for now, and I told him yes. (Tanazia, journal entry, 2/13/04)

In describing the incident to Beth, Tanazia talked about how glad she was to have someone on her side when she came into school after the car accident. She felt comfortable asking Ian for advice about the fact that her boyfriend did not have car insurance. Tanazia knew that Ian would not judge her situation, but

instead would be willing to help. Essentially, Ian acted as a resource for Tanazia in her time of need. Because she trusted and respected Ian, she felt comfortable asking him for help.

Reframing expectations

One way that Ian differed from many of the teachers at Leach Learning Academy was his laid-back attitude. The students' experience with more traditional teachers became evident to him after only a few weeks into the school year: "After a week here at [Leach Learning Academy] I have noticed some major obstacles for myself. I am repeatedly reminded of the fact that these students are used to a very strict teacher" (Ian, journal entry, 9/12/03). Some of the expectations Ian had in his classroom deviated from those the students encountered in other classes; for instance, Ian allowed the students to eat in class, which according to the school-wide policy was not permitted. Ian did not argue with students about eating, especially in his first period class when it was often a challenge to keep students awake. He knew that students were eating breakfast, which to him, was important. When asked about this, Tanazia and Ann described the school rules pertaining to food and how the issue played out in Ian's classroom.

Beth: What about the eating thing? Is that an issue?
Ann: Oh definitely yes.
Tanazia: Well, the principal doesn't allow it. But I guess because our class is well behaved and we don't leave trash all over the place it's like a privilege for us. And, you know especially, some students early in the morning they have to have breakfast or something like that.
Ann: You know, I never noticed that. In that class I never see any trash on the floor and in all my other classes when people sneak and try and eat, there's trash and crumbs on the floor and no wonder teachers get all freaked out about it.
Beth: Well do you think that people are more respectful cause they're allowed to do it, because Mister Stith doesn't make a big deal about it?
Ann: Probably, yeah, that's probably it. And his personality, because he's real nice and I guess he clicks with everybody.
Tanazia: He probably set that standard also, like uh, as long as you don't leave trash around, y'all can (eat).
(Interview transcription, 2/13/04)

According to Ann and Tanazia's perspectives, eating in class caused little disruption, especially since Ian did not draw much attention to it. In other

classes, however, students felt the need to sneak food because they knew teachers would, to use Ann's words, "freak out about it." Although Ian was clearly bending the school rules, little distraction was caused by allowing the students to eat in class. Because they felt respected, the students themselves respected Ian's classroom by keeping the area clean. Ian was able to build bridges and social capital with students through respect; by allowing students the freedom to eat in class when they were hungry, he made it clear that the students were adults and could make their own decisions about when and where to eat.

Other instances also showed that Ian's attitude toward certain student behaviors was different than that of other teachers at Leach Learning Academy. For example, he often let students listen to music on their headphones if it helped them concentrate and work more expediently, which other teachers might have considered a distraction. Also, rather than making a commotion about an individual who came in late, Ian merely accepted the student's pass and continued on with the activity—he rarely said anything to the student until after the period ended. The routine was that students who entered class late would come in and immediately get started with work that was in progress. Interestingly, Ian never complained about having to repeat a set of directions for an activity that a late student had missed. Overall, Ian upheld a laid-back demeanor, which allowed for an atmosphere where students felt comfortable rather than constrained and did not fear that Ian would get upset if they made a wrong move.

"They gonna call the cops"

One of the comments Beth heard most often when talking with Ian's students was that he was unlike other teachers they had experienced. For instance, from the first day, Ian stood at the door as the students entered so he could greet them; however, he found it surprising that the students were taken off guard by this action. They were unaccustomed to a teacher taking a few moments to say hello. They were even more precarious when Ian extended his hand to them on the first day in an effort to introduce himself. When he extended his hand to one student, the student responded by saying "Fuck you" and walked away.

It was evident that many of Ian's students had designated a cultural model of a teacher that did not encompass some of the practices that Ian embodied. Cultural models are "videotapes in the mind, tapes of experiences we have had, seen, read about or imagined," which become one's conception of reality (Gee, 1999, p. 60). The students had constructed a conception of math class based on their histories as math students. Regardless of the students' initial resistance, Ian was determined to be respectful to students and treat them in a manner that he

would expect to be treated. He found, however, that this was in dissonance to the practices of other teachers that his students had experienced.

During another after school cogenerative dialogue, the discussion turned to a comparison of Ian and other "strict" math teachers. One after another, the students remarked that one of the other teachers at Leach Learning Academy, Mister Leslie, had extraordinary classroom management skills. They claimed that students were afraid to enter his class late and could often be seen running furiously down the halls to his class. Some of the students agreed that he was an effective teacher; however, Larry added an important caveat that elucidated what he believed to be a huge difference between Ian and Mister Leslie.

> All right, if, all right, if somebody saw Mister Leslie gettin' beat up on the streets, they ain't gonna call the cops. I ain't gonna call the cops. If somebody saw Mister Stith they gonna call the cops. They gonna try and help him or something. Ain't nobody gonna try to help Mister Leslie. (Larry, cogenerative dialogue, video transcription, 2/24/04)

Larry's openness about being willing to help Ian if he was in danger epitomizes the social and symbolic capital that he built with Larry, a student was considered a "discipline problem" by many other teachers at the school. Ian had built a trusting relationship with Larry. To Larry, Ian was a caring teacher who he could trust and would help out if necessary. When students and teachers "have each other's backs," a sense of communalism emerges, and serves to promote bridges across social and cultural borders. These bridges resulted in increased social capital.

Is he a push over?

Even though Ian was able to successfully accrue social capital with his students, he often worried that his laid-back nature was detrimental in some ways. In one cogenerative dialogue, both Cindy and John, students from two different classes, concurred that Ian was "too nice sometimes." Tanazia also remarked about Ian's personality and her initial impression of him.

Beth: So what are the negatives of being laid back?

Tanazia: A lot of students take advantage of him. It's a talking period. A lot of people think that's what it is. At first, when I saw Mister Stith, I was thinking, aw, here goes a teacher, another teacher that the students are gonna run off. That's what I thought. Because he looks like he's too quiet at first. (Cogenerative dialogue, video transcription, 10/28/03)

The comments made by Cindy, John, and Tanazia suggest that, in some ways, they perceived Ian to be too amenable. During his first year, he was no stranger to the typical classroom management challenges that affect many new teachers. However, Ian's concern with controlling his students came second to his interest in serving as a guide and confidant. Ian discussed his thoughts about the students' concerns in response to two of Beth's interview questions. She asked, "What was your response to students saying that you weren't authoritative enough? Did you learn anything from it?"

> Well, I agree with them. But I still didn't think that being overly strict was the best way to do it because I have a problem depersonalizing things. Like, me just yelling at the class is just not going to happen. Because I remember being in classes and the teacher yelling and you were always like, "why is she yelling at me? I didn't do anything." I always hated it and I think the kids feel the same way. I mean my whole thing is trying to build relationships with each of the students, so just making up these policies goes against that in a way. And I hate that as a teaching I'm supposed to be constantly *controlling* everything. I have a problem controlling them, because I feel like that's wrong. (Ian, interview transcription, 6/7/04)

Even though Ian was open to the students' concerns about his passivity, he had strong feelings about his classroom management style. To Ian, controlling the students was contradictory to his objective of getting to know them and building social capital with them. Ian was aware that his lenience in the classroom went against the norm. Controlling student behavior often becomes an overarching goal in urban classrooms: "In many schools there is a fixation with behavior management and social control that outweighs and overrides all other priorities and goals" (Noguera, 2003, p. 341). However, as an individual who was aware of such norms and had great respect his students, Ian was reluctant to yell at students or attempt to control their behavior.

"He has my full respect"

Throughout this chapter, we have described some of the structures Ian encountered as a first year teacher and highlighted examples of Ian's agency in the context of these structures. Similar to the issues cited in the literature, Ian experienced a lack of support and felt overwhelmed at times. However, Ian's story shows that he was able to successfully achieve his personal teaching goals and teach in ways that aligned with his epistemological and pedagogical beliefs.

Consistent with his philosophy, Ian wanted to help students who had previously been unsuccessful in math. However, he knew that a precursor to this was

building social capital with students. Throughout our analysis, we described ways that Ian was able to get to know students, utilize their perspectives for classroom decision-making and build relationships with them across social and cultural borders, even during his first year. Although Ian voiced several concerns with the organization of Leach Learning Academy and the unfolding structures that emerged, those structures nevertheless supported Ian's goals and teaching style, which transpired as a strange dynamic. In the following chapter, we detail Ian's a second major pattern that emerged during Ian's first year: his use of science activities to teach mathematics.

Each of the preceding quotes came from anonymous surveys, created originally with the help of Tanazia and Ann. The students' responses to the open-ended survey provide insight to their constructions of Ian's practices.

He explains things to me that other teachers wouldn't take the time to explain.
He actually wants to "teach."
He actually teaches, he doesn't just stand up at the board and read off information like some other teachers.
He helps me out, and no matter how many times I call him for help he never gets upset. Sometimes I get very frustrated and just give up and that's when Mister Stith tells me I can do [it] and helps me with the work.
Mister Stith treats you the way that he wants to be treated. So therefore he has my full respect.
He always say[s] good morning everyday and has that big smile in his face.
If I don't understand he'll always go to the limits to help me understand. He does lots of activities and real-life examples to help us understand the problem. If I don't understand something, Mister Stith is always there to help me one on one.
He respects me and he wants to see me and all the other kids be successful.
It seems as if he cares about his students' education a lot more than other teachers at [Leach Learning Academy].
He helps by making all the activities fun. I figure having fun is always a better way to learn. While having fun I have been learning more than I thought I would.
He treats us like he would treat his mother.

Many of the quotes above reiterate the themes that emerged in this chapter. We were surprised, however, to find that the students' comments said so much about the relationships Ian had built and the benefits that the students had accrued from being a part of his classroom community. In essence, the comments speak loudly, perhaps even more loudly than our data analysis and discussion, about Ian's agency, his practices, and the potential for learning in urban classrooms.

6 Restructuring the classroom: Math in a science way

The traditional function of math education was to identify bright young potential mathematicians and steer them into math programs based on university campuses. The process was almost self-selecting. Before you could get to anything interesting you had to absorb a lot of abstract math, unlike, say, social studies or even English, which in the hands of creative teachers could be presented effectively and interestingly through literature, stories and events. These subjects didn't have to be boring; math was expected to be. (Moses & Cobb, 2001, p. 9)

Consistent with Moses and Cobb's claims about mathematics, Ian's students claimed that lecture-based classes that centralized abstract textbook problems were the norm at Leach Learning Academy. After the discussions that emerged in several cogenerative dialogues and in our informal talks with students, it was clear that many students were intimidated by math. For the most part, the students we talked to disliked the subject or thought it was boring. Moreover, the challenges that emerged from the school's implementation of the Core Plus Mathematics program, which we described in chapter five, was a source of the students' frustration. Most students claimed that they disliked math mostly because they thought they were not good at it.

Out of the 27 students in Ian's first period class, ten (37%) had failed math previously in high school. Overall, their remarks strongly resonated with Moses and Cobb's (2001) discussion of math illiteracy. They suggest that in addition to the fact that math is supposed to be boring, it is also acceptable for students to admit defeat in math classes.

And in the culture itself—our culture—illiteracy in math is acceptable the way illiteracy in reading and writing is unacceptable. Failure is tolerated in math but not in English. Your parent may well lean over your shoulder as you struggle with the term paper . . . making sure that you write it, checking the spelling and the grammar. But if you're

struggling with an equation while doing your algebra homework, more likely your parent will look over your shoulder, wrinkle a brow in puzzlement, then say something like "I never got that stuff either; do the best you can and try not to fail." This is an old problem. In effect, math instruction weeds out people and you wind up with what amounts to a priesthood, masters of the arcane secrets of math through what appears to be some God-given talent or magic . . . not being "good" in math does not in any way imply inferiority, rather, it confirms that you're just like most everyone else. (2001, pp. 9–10)

Stepping into the math classroom at Leach Learning Academy, Ian encountered multiple challenges. He first needed to confront and reframe the students' anti-math perspective. Then, he had to assess their current knowledge. After both of these steps, Ian could attempt to teach them the material in a meaningful way. Because there was no organized eleventh grade mathematics curriculum at Leach Learning Academy, he had some leeway in choosing activities and setting goals in his classroom as long as he somehow tied instruction to concepts in the Core Plus math text and the mandated standardized test review work. To do this, Ian chose to incorporate science-based activities by including labs and investigations and by emphasizing the process over memorization. Ian described his rationale as follows: "I always [thought] that it made more sense to see math as a tool for science rather than as a set of arbitrary rules. Plus, I felt more comfortable teaching science than math" (Ian, interview transcription, 3/4/04).

In this chapter, we detail the ways in which Ian taught "math in a science way." Previously in chapter five, we described some of the institutional structures that unfolded as Ian came to understand and interact with students within the culture of Leach Learning Academy. We illustrated that although some of the structures were challenging or overwhelming for him as a beginning teacher, they generally supported his teaching style and personal goals. In this chapter, we elaborate on this idea by describing the pedagogical aspects of his teaching. Ian's choice to teach his math classes using science activities emerged from the data sources as a pattern that inherently illustrated his agency as a beginning teacher.

Increasing student understanding with visuals

This morning Ian's creativity shines. He has tied strings to opposite walls so the students can actually see what parallel lines look like. He has also tied a string diagonally through the parallel lines to show the concept of an intersecting line. The strings are above the students' heads, however with a chair, one can get up and measure the angles made by

the intersecting line with a large protractor. It's a great help visually. (Beth, field notes, 9/20/03)

From his first days at Leach Learning Academy Ian chose to redefine the classic routines associated with math class. He made every effort to construct his lessons around hands-on activities, some of which he and Jack had used in their engineering physics class. Ian wanted the students to visualize the abstract concepts he was teaching, and emphasized understanding the mathematics conceptually rather than memorizing prescriptive rules. For Ian, enabling students to learn the material in different ways enabled him to meet this goal. Thus, instead of merely explaining a theory, he would often seek enhanced understanding by representing the concepts visually or by having students perform hands-on activities.

For instance, instead of drawing parallel lines on the board or on a worksheet, Ian physically constructed parallel and intersecting lines in the classroom using long pieces of string. To do this, he affixed long pieces of thick string to opposite walls in his room a few feet above the students' heads. To see a concrete application of the concept, they simply had to look up. This model made the ideas of parallel and intersecting lines easy to understand and was more interesting and creative than lines drawn on a chalkboard. It was also a tangible resource; Ian used the strings for an activity in which the students measured the angles created by the lines with the large protractors he had on hand.

It was my goal to help the students grasp the concept of three-dimensional space and the rectangular room was an ideal coordinate plane. Lines drawn on the board cannot really show the infinite nature of parallel lines and their relation to each other. Using the strings allowed the students to see physically how the lines were restricted to one plane while the walls and floor exist on other planes. In addition, the concept of parallel lines has the potential to be tedious, so suspending the strings simply puts a new spin on the topic. It would be almost impossible to not notice the strings as you walked in the room. I made sure to ask the students, questions about the strings so that the lesson would begin right away.

The use of the room as the coordinate plane draws the students into the lesson as well. The walls and floor create a box that they exist within. They can see the angles formed between planes and how they relate to those reference points. Lastly, the large-scale model gets the students to walk around and discuss how to measure the angles and lengths, which makes the experience more authentic. (Ian, written narrative, 6/4/04)

Ian also had the students create their own posters when possible to illustrate a concept. He added to the student work with commercially made posters and his own homemade ones. All of these were visible to students around the room

Figure 6.1. Ian uses his wall of math vocabulary to emphasize important concepts.

and they could use them as resources at any time. Ian also created a word wall of important math lexicon, which included words such as dependent variable, *y*-axis, *x*-axis, and other terms they were currently using or expected to understand (Figure 6.1). By exposing students constantly to such vocabulary, Ian sought to increase students' exposure to and literacy with important math terminology.

The students also mentioned the value of Ian's visual examples and the power of his hands-on activities:

> [The concepts are] easy to understand. Especially when he uses like visuals, or visual aides to help out students. Like, he uses the strings with the triangle and he gets us involved. That's what I like about it. And most teachers they just sit up there—teach you at the board and expect you to know everything. (Tanazia, video transcription, 10/28/03)

In the above narrative, Tanazia described Ian's use of visual aids in contrast to other teachers' practices. Her comments suggest that her experience in Ian's class was much different than other classes she had encountered. As a student who had failed math in the past, Tanazia was happy to have the visual aids to use as resources and became more comfortable with the concepts. She also enjoyed getting involved in hands-on activities; she believed that Ian had created them in order to "help out students." To Tanazia, these two strategies differed

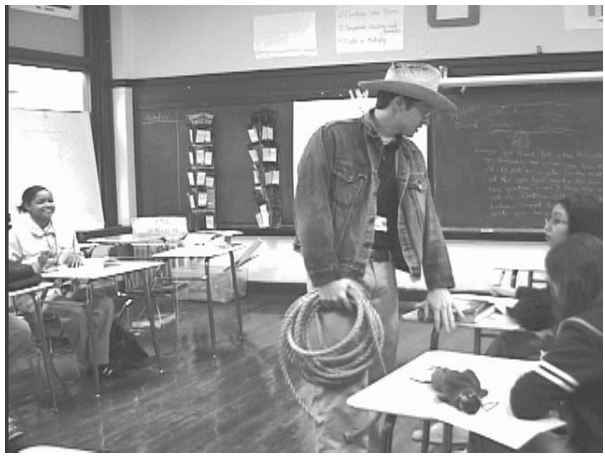


Figure 6.2. Students watch Ian begin the law of cosines activity in his costume.

significantly from her other classroom experiences, in which teachers "just sit up there—teach you at the board and expect you to know everything."

Drowning in the river

Whenever possible, Ian tried to incorporate a "hook" into his lessons—an attention-grabbing introduction that would get the students interested and engaged. Many of these introductions showed his sense of humor and interest in doing creative things for the good of the lesson. For instance, one morning, after the students had finished their pre-class activity, Ian quickly changed into a costume at the back of the room. He put on a jean jacket, a cowboy hat, and a carried a rope. When Beth asked him later about it, he claimed that was clothing that someone who would work at a river might wear (Figure 6.2).

After surreptitiously changing his clothes, Ian made his way into the middle of the classroom and stood on top of a student desk (Figure 6.3). Before class, he had arranged the desks so that there was a large space in the middle of the room, which would symbolize a river. The students' desks were arranged in rows on each side so that everyone could see the center of the room or the river. He then asked for a student to volunteer to be the person drowning in the imaginary river. The following interaction ensued.

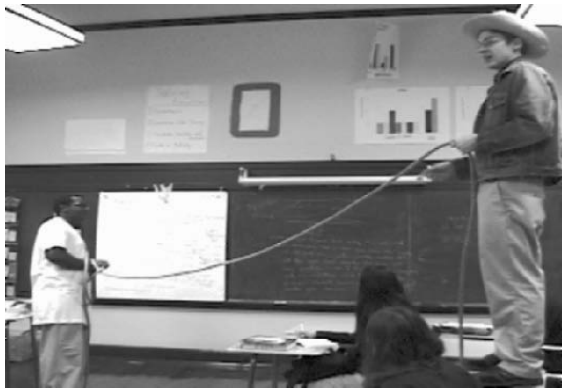


Figure 6.3. A student participates in Ian's "drowning in the river" activity for the law of cosines.

((*Ian walks to the center of the room, wearing a jean jacket, a cowboy hat, and holding a rope. He steps up on a desk. Everyone quiets down*))

Student: Hey Mister Stith! ((*Students laugh and smile as they watch him*))

Ian: Okay, well I need someone to be drowning, on that side. *((points to other side of room*))

Anton: I wanna drown! ((*Anton stands up and grabs rope*))

Ian: All right, stand over there. Okay, so we have the river set up her right, right in the middle of the room. Anton's in there, struggling. He didn't pay attention in gym, so. Oh, you guys don't have a pool. So I'm gonna throw a rope to him, I'm gonna throw a rope to him, and I'm gonna figure out how far he flowed down the river. ((*Anton pretends to struggle by flailing his arms and one leg about*)). All right. So, here's—here you go. ((*Ian throws the rope to Anton*)) Okay, so, now-

Anton: Where's the river goin'?

Ian: Flow down the river. ((*Anton walks away from his initial position with the rope*)) All right stop. Okay. So now he went from there to there, right.

Students: Yeah.

Ian: And the problem—I know how far it is from him to me on the string, and I know the angle. So now, can you grab a protractor, or you're in the river. ((*Students laugh*. *Another student gets up and grabs it*)) Okay, so then if I want to figure out the angle I just use the protractor here, and line it up with me as a point, so I put this along the string, and say if he was like, right over there by Cindy, so that'd be about sixty degrees. Alright, so we know that, and then we can measure we can measure how far it is along

> the string, or the rope, we can figure out how far he went, so that's one meter. It's about three meters. So the way you're going to figure this out is using the law of cosines.
> (Video transcription, 11/5/03)

After Ian's dramatic demonstration to show how a triangle could be created between a person on the riverbank and a drowning person, he asked the students to break up into groups and work on the problem on their own (Figure 6.4). He told the students to create their own riverbanks and rivers between two student desks. Then, they were to throw the string across the imaginary river to a partner. Once they had created a triangle with the string, they were asked to measure the sides and the angles with rulers and protractors. Using the law of cosines, they were supposed to calculate the distance that the person floated down the river. Additionally, Ian required that the students draw the triangle onto a separate sheet of paper and use it to figure out the angles. The students were instructed to throw the string, create a triangle, and perform their measurements at least three times. As the students worked on the activity, Ian circulated to make sure that everyone understood the directions as well as the concepts that he was trying to target. When one group of students appeared to be off-task, Ian sat and helped them work through one of their triangles.

This lesson was significant for several reasons. First, it was creative and showed Ian's agency. He initially captured the students' attention using a demonstration—a method he had used often in physics during his student teaching.

Figure 6.4. The students work on the river law of cosines activity at their desks.

By changing into a costume, Ian captured the students' attention immediately and positively affected the mood of the classroom. They were immediately engaged and paid attention to what he was doing because it was so out of the unexpected. Four months later, in a cogenerative dialogue, the students still laughed about the costume Ian used for this particular lesson. Additionally, Ian performed the demonstration by standing on top of a desk. This altered the typical focus in the classroom, which normally would be at the front of the room, in the center. Second, after the demonstration, Ian instructed the students to enact the same situation at their desks using strings. Thus, the students had a chance to participate in a lab-like activity using the math concepts and could see the law of cosines come to life.

The velocity activity

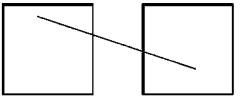
A classic concept taught in any physics class is velocity. The concept is something each student can relate to on some level, be it the speed and direction of a trolley or the pitch of a fastball. Unfortunately, students are usually only exposed to this concept in physics and rarely see how the math they know applies to it. If students do not have the opportunity to take physics, which is typically considered an advanced science course in the United States, they may not have the opportunity to fully understand velocity. Because Ian worried that his students may never be exposed to the concept, he decided to incorporate a velocity activity into his math class. He also realized that it would be a perfect opportunity to discuss slope, dependent variables, and data analysis in an investigative way. Ian realized that these topics traditionally would be taught by discussing an intangible example that students would never be able to touch or see. Also, he remembered his frustration when teaching velocity in his physics class at City High; like other science teachers Ian often had to reteach the math involved in some of the concepts.

In order to perform the investigation, the students in Ian's class were instructed to affix one end of a piece of string to the wall and the other end to the floor. Prior to the activity, Ian had created several a sliding weights by taping a stack of five several coins to one end of an opened-up paper clip. The weights would slide down the string without falling off. Using a stopwatch, students gauged the amount of time it took the slider to move from the top point of the string to the bottom point (Figure 6.5). The students had to calculate the distance the slider moved and divide it by the time it took. They then had to chart varied distances and graph the calculated velocity for each example.

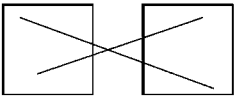
River Activity

3 people maximum per group

1. Move the desks next to each other such that the desktops are parallel.
2. One person will be the rope "thrower" and the other will be the catcher.
3. First, throw the string across the desks so that that one end is one each desk.



4. Measure the length of the string between the desks.
5. Put a small piece of tape where the string touches each desk so that you can measure the angle later.
6. Now throw the string again, this time the other direction, making a triangle.



7. Measure the string length again.
8. Measure the angle between the first string and the second—use your tape markers to help.
9. Draw and label a picture of your triangle
10. Use the law of cosines to calculate the 3rd side of your triangle:

$$c^2 = a^2 + b^2 - 2abcos\text{Ø}$$

Figure 6.5. Ian created the above worksheet for students to use while they were working on the river activity for the law of cosines.

As we observed the students' participation in the velocity activity (Figure 6.6), we wondered if they actually understood the relationship between the activity and the objective of the lesson. Beth decided to talk to some of the students informallyabout what they were doing and how it related to mathematics.

Beth:	((*I approach Leah as she records the distance and time on her graph, while her partner works the slider*)) So what are you guys doing?
Leah:	We're tryin' find the uh, velocity.
Beth:	What does this have to do with math?
Leah:	We tryin' to find, we have to calculate the distance divided by the time to get the velocity.
Beth:	Is this the chart you guys have to make?

Figure 6.6. A student works on the velocity activity.

Leah: Um hmm.
Beth: So you time it from–
Leah: From start to stop, and he times it from start to the first point–
Beth: That little mark?
Leah: Yeah, one of them.
Beth: Why do you have to do a point?
Leah: So we can subtract the start time from the stop time. We gotta subtract that, the start time to the point.
Beth: What does that give you?
Leah: It gives us the time.
Beth: Hmmm. Okay, thank you.
(Video transcription, 11/17/03)

By talking to some of the students informally, Beth was able to discern that they understood both the purpose of the activity and how it related to lesson objectives. Leah's answers suggested that she understood how the activity related to the concept of velocity. She also could describe, using her own words, how to find the velocity of the slider. Tanazia was also able to apply some previous knowledge from the class into the velocity activity:

Beth: ((*Walks up to Tanazia and Ann, who are working together*)) What are you guys doing?
Tanazia: We're writing up the slider activity.

Beth: So how are you using math with that?
Tanazia: Well, in this case we're times-ing, $v \times$, actually it's velocity equals distance over time. So we're times-ing (multiplying) the distance it took that'd be three feet, and the time we got on the stopwatch. And we're getting the speed, the velocity.
Beth: So you had to put it into an equation?
Tanazia: Yes.
Beth: Interesting. What are you guys working on since you're done?
Tanazia: We'll we're just finishing on the graphing part after this-
Beth: Oh then you have to graph it?
Tanazia: Um-hmm. ((*Nods*)) You have to graph to show-
Beth: What are you showing with the graph?
Tanazia: Um the speed.
Beth: How it changed?
Tanazia: How the distance is um, independent from the speed. Well actually, mine is kinda crooked. ((*Smiles*))
Beth: What's the difference between independent and dependent?
Tanazia: Um, the independent, is what um, is used to, I need to um– ((*Looks to Ann*))
Ann: I'm still tryin' to figure that out.
Tanazia: Well it stands alone, it stands by itself, it doesn't need anything to help it. Speed would be the dependent on the distance because it depends on how far up it goes for the speed to accelerate.
Beth: Okay–
Tanazia: Yeah, (Mister Stith) told us that like the beginning, like the first day we came here, so that's why it's still fresh in my mind.
(Video transcription, 11/17/03)

In this conversation, Tanazia began by describing the equation she was using to calculate the velocity: $v = d/t$. She also knew how to use the data she had collected with the slider in the equation. Secondly, Tanazia understood that the graph was a means to represent the equation and was working to graph her data. Although Ann was confused at this point, after Beth left, she was able to use Tanazia as a resource to explain the concepts. Finally, Tanazia was able to differentiate between independent and dependent variables, an important concept for the graphs. Even though Ian had taught the difference between independent and dependent variables in the first few weeks of the school year, Tanazia was able to draw on this previously learned knowledge two months after.

The tangent activity

The basic trigonometric functions are often utilized in the physics classroom. For example, if a force analysis is done or a net displacement is calculated, in order to find a missing length of a triangle, one needs more than just the Pythagorean theorem. Similar to other concepts, in most math classes these functions are taught in a vacuum with little to no practical explanation given. Often sine, cosine, and tangent, the three main trigonometric functions, are discussed all at once with little more than a triangle and the equation provided. However, Ian tried to change the approach generally used to introduce the trigonometric functions in an effort to help students discover how they could use the concepts as tools in a real-life situation.

To begin the tangent activity, Ian posed a driving question as he would in a science lab: how does the angle of attack change as a person moves further from the base of the wall and jumps as high as she can? The students' trajectory along the wall and floor created a right triangle. They could then use these measurements to calculate the angle. In this particular activity, the students created, recorded, and graphed the data themselves (Figure 6.7).

In order to build on the student interest, the activity was contextualized within the game of basketball. Ian realized that this would be an immediate point of interest for many of his students. Also, as a hook, Ian himself participated in the activity by performing a few of the initial jumps and then challenged the students to beat his highest jump. Not only did the students really enjoy watching Ian jump, they also were motivated by the challenge of possibly beating him. Ian described the activity and his thinking about it as follows:

> This activity was an introduction to the concept of tangent. It is important to build up the students' confidence with new topics, especially something as abstract as tangent. Simply drawing a triangle on the board along with the definition of tangent is not enough for most students. An activity such as this allows them to compete, measure, discuss, and learn all at once. I realize, however, that although some students might understand the concept as a result of this activity, it is necessary to continue with a follow up lesson to reinforce it. In the future I would like to have more space for this activity and allow the students to see all their triangles at once so they can really see how dramatically their attack angle changed. (Ian, written narrative, 2/10/04)

In using hands-on activities such as the basketball tangent lab, Ian realized that additional instruction or reinforcement was important, especially for students who had difficulty connecting the activity to abstract, text-based problems. Therefore, Ian's instruction was reflective of his students' needs. Also, as he illustrates in the narrative above, Ian was constantly reflecting on ways he could

Basketball Tangent Activity

How does the angle of attack change if you move further from the base of the wall and jump as high as you can?

Procedures:

1. Set up your court. Tape the string to the floor _ meter away from the wall. Make sure you have room to jump.

Set up a table on your own paper as shown here

Trial #	Distance from wall (m)	Height Reached (n)	Angle

2. Pick a person to go first. Each person should collect his/her own data.
3. The 1st jumper should now pick up the other end of the string and stand, feet together, next to where the string is taped to the floor. On the end of the string in your hand, put a piece of tape. This will allow you to mark where you can reach.
4. From the standing position, jump as high as you can and stick the tape on the wall. Now tighten the string so it makes a triangle.
5. Measure the height you reached and record it in the table. Be sure to use meters.
6. Calculate the angle at which you jumped:

$$\text{Tan } \emptyset = \frac{\text{Height reached}}{\text{Distance from wall}}$$

7. Do two jumps at this distance. Each person takes a turn.
8. Change the distance to 1/2 meter and repeat.
9. Change the distance to 1 meter, 1 1/2 meter, and 2 meters.
10. Graph your results.

Figure 6.7. The worksheet that Ian distributed to students, which listed the procedures for the basketball tangent activity.

improve his activities for future lessons. Similar to student teaching, reflection and praxis became central aspects of his instruction.

The drawbacks

Although most students spoke positively about the hands-on activities in Ian's Core Plus III math class, some students were not very excited or motivated by the labs, investigations, and demonstrations. Two months into his work at Leach Learning Academy, Ian expressed his concerns in a journal entry.

> Another issue I am having is general fun during the day. Many days I have something to do that involves moving around and measuring but still some students just don't want to do anything regardless, because it's school. I really want them to feel more comfortable with math in general but it is hard with so much resistance. I just wish some of them would forget it is school and that they don't want to be here and think about what the activity really is, so they can enjoy it. (Ian, journal entry, 11/20/03)

Even though he had structured the class according to what he thought students would enjoy, Ian still encountered challenges with motivation and resistance. Patterns within the students' interview data show that the students enjoyed and preferred project-based math lessons, however, a few students expressed that they would prefer a traditional, teacher-centered math class in which they were given problems or a worksheet and were allowed to work independently. Because Ian felt that the activities were worthwhile and that the majority of the students enjoyed them, he continued to create interesting science-based lessons.

> If it was a recurring thing [students who did not want to engage in hands-on activities], I would give them something else to do. There were one or two kids who repeatedly wouldn't do stuff. So I would make up alternative work for them. Just general math problems I would give them. Usually I would convince them that it was fun and that they should do it and that would work. Or I would pester them until they would do what I wanted because they would want me to stop bothering them [laughs]. (Ian, interview transcription, 6/7/05)

Although Ian wanted all of his students to get involved in his creative activities, he was also sensitive to students' needs and comfort level. He understood that some students would be more comfortable working individually or might learn a concept better by a more traditional explanation. Because he spent time getting to know them and assessing their needs, he had a good sense of the students that he might have to cajole into participating in the activity. When that did not work, Ian tried to help the student by finding textbook-based problems that fit the objectives of the lesson.

Expanding agency through science-based math

Ian expressed concerns with his teaching methodology at times, yet doing science-based math activities enabled him to restructure the class in a way that fostered his own agency and that of the students in several ways. First, the activities gave the students a context for the concepts they were learning. For some students, this was the first time that had an opportunity to see math in action. They were usually able to better understand the concepts because they were embedded in practical problems or real-life scenarios. Other times, students were able to visualize the concepts as a result of the activities, which made even the most abstract theories more tangible.

Second, because of Ian's unique teaching style, students were able to see the applicability of math as a tool for science. As they began to use the concepts

solve problems, they were actively adding to their toolkit of resources. In some cases, students could use these resources in new and different ways, which was a prime illustration of human agency. For instance, Tanazia's ability to use her knowledge of dependent and independent variables in the velocity activity was an example of her power to access and appropriate resources in a way that would further enhance her learning in math class.

Third, most of the lab-like, investigative activities described in this section enabled the students to work independently or in small groups. This structure made it possible for Ian to accomplish his goals of getting to know students and working with them one-on-one, which we described in chapter five. Thus, Ian's pedagogical and personal goals were mutually dependent; his implementation of science-based math enabled him to build social and symbolic capital with students. In order to get the students to "buy in" to some of the more hands-on activities and participate in meaningful ways, he had to use some of the social and symbolic capital he had accrued with them as exchange value.

Finally, using physics and other science-based activities was also a pragmatic decision based on Ian's comfort level with the subject matter and pedagogy. As he mentioned, he felt more comfortable teaching physics, probably because of his student teaching experience. During student teaching, Ian spent more time in the physics classroom than in the math classroom. He also felt more confident about teaching physics since he considered his coteaching experience with Jack at City High School to be successful. Moreover, Ian realized that with some modifications, he could replicate the activities that he had spent time creating for engineering physics and during the summer curriculum development project. Rather than starting from scratch, Ian reflected on his prior use of the activities and worked to strengthen them.

Although some of the structures at Leach Learning Academy were problematic and open to critique, they nonetheless supported Ian's capacity to teach math in a science way and to work with students both individually and in small groups, rather than in only a whole-class instructional format. We described Ian's methods of teaching math through science as an example of his agency because in order to teach in this manner, he had to access and appropriate resources in creative ways. This pedagogical style also aligned with his philosophical and epistemological beliefs about the interdependence of science and math. However, in order for students to become interested in the science and math activities that Ian planned and enacted, it was vital that he build both social and symbolic capital with them. Through the use of cogenerative dialogues and by getting to know the students individually, Ian could work to relationships with them that bridged cultural and social boundaries. Additionally, he also

worked hard to incorporate student perspective into his planning and teaching at Leach Learning Academy.

Although we discuss this in more detail in chapter seven, the patterns described here show that Ian's practices were transferable across fields; the practices that Ian engaged in during his student teaching experience reemerged in his classroom at Leach Learning Academy. For instance, Ian's goal of building bridges with students that led to increased social capital at City High surfaced again in his work at Leach Learning Academy. Additionally, Ian used many of the same activities and labs with modifications for his math classes at Leach Learning Academy. Thus, even though he was not teaching physics at Leach Learning Academy, he resourcefully used some of the same methods and previously created activities in his lessons there.

7 Returning to City High

After a full year of teaching only mathematics at Leach Learning Academy, Ian packed up his classroom materials and prepared to wait. Similar to the situation he had encountered close to a year ago, Ian was forced to wait to hear where in the school district he would be placed. Because of his friendships with Jack, who had taken a position back at City High School, and Mister Reyes, the coordinator for the science, engineering, math, and motivation small learning community, he had hoped to get a position at City High School teaching physics and math, and possibly expanding on the engineering courses they had begun offering during his student teaching.

Ian thought that City High would be a good fit for him because of his interests, but he also realized he could be moving into a more chaotic school since City High had changed in the time he had been away. A new principal was now in place. Furthermore, Carol had moved out of the small learning community coordinator position and into a vice principal position. All of these changes were typical of schools in the district, but it still made Ian apprehensive about the change. Regardless, Ian decided to go back to City High and try to pick up where he had left off. Ultimately it was not up to Ian or even Carol as the vice principal to decide if he would be teaching at City High. As we chronicled in chapter five, it all depended on the position being available for him to choose when he was called in by the school district. Ian waited until the middle of July when he got his chance to choose his school again and hoped that his position would be there waiting for him. Thankfully, albeit with much stress and confusion, he got the position at City High School.

With his position now set, Ian started once again in a new room, in a new school, with new students. Surprisingly, he found that once more it was up to him to initiate this transition. After his experience the previous year, he knew that it was his responsibility to get the logistics of the job worked out before the school year began, so he planned to start early this time. However, the school

was being cleaned and no one could go in until September, not that it really mattered since Ian didn't know what room he would have or what he would be teaching, or even whom to ask about those issues. In the end he just had to wait until three days before the students came to prepare for the year.

In this chapter, we detail Ian's second year as a mathematics, physics, and technology teacher at an inner city high school. In an effort to further elucidate Ian's trajectory as a beginning teacher, we highlight his practices amidst the dynamic structures that emerge as he returned to City High. Before discussing the patters that we observed in his classroom, we first distinguish between the institutional structures at City High and Leach Learning Academy. We then discuss the changes that occurred at City High. We continue to investigate the structures that unfolded on an institutional level, as well as those within Ian's classroom and in his small learning community. A description of these structures is an important preface to Ian's teaching practices (both conscious and unconscious) and his specific goals. Thus, throughout the chapter, we make explicit connections between Ian's agency and the structures that surround him, highlighting the ways in which he is able to meet his goals in the classroom. In many ways, some of the practices we describe exemplify his agency.

Transitioning from Leach Learning Academy to City High School

Although Ian had come to know the culture of City High during his student teaching experience, upon his return a year later, he found that the school had changed significantly. In the sections that follow, we describe the changes that Ian experienced in the transition from Leach Learning Academy back to City High in terms of contrasting structures. Specifically, we explore the differences between Leach Learning Academy and City High insofar as Ian's roles, the curriculum, school-wide structures, and temporal resources.

Emerging responsibilities

At Leach Learning Academy, Ian's roles and responsibilities were somewhat limited. Because he knew he would only be there for one year, his work was restricted to planning and teaching five sections of eleventh grade integrated mathematics. He was not assigned any additional responsibilities, except for the robotics club, which he chose to establish at Leach Learning Academy because of his own interests. However, only three students were involved in the club and they only met a few times during the year. Thus, Ian's day at Leach Learning Academy involved little more than planning for his course, teaching for five, 45-minute periods, and tutoring students after school. He had a period free for

lunch, during which he generally ate the sandwich he had brought alone in his classroom. He also had an open period during the day to plan and prepare for his classes. At City High, however, his roles and responsibilities grew. Interestingly, many of his responsibilities emerged organically as a result of circumstances within the school—namely, the school's lack of human resources. Two major responsibilities emerged in Ian's new position at City High: teaching new technology courses and supervising the school's computer lab.

Becoming a technology teacher

When Ian took the position at City High School, he was happy that he would again have the opportunity to teach both physics and math. However, at the end of the summer, right before the school year was about to begin, he found out that one of the courses he would be teaching during the fall semester was radically outside of his comfort zone.

> The position that I took at City High School was a math/physics combination. I also knew I would have to teach engineering classes. For some reason though, Mister Reyes wanted to offer technology classes. He asked me at some point during the summer—could I teach a computer programming course? And I said no, not really, I don't know too much about it, but maybe if it was really easy. And that turned into me teaching two technology classes—one was visual basic, which I had heard of, but I didn't know anything about. (Ian, interview transcription, 6/24/05)

Although Ian was not prepared to teach a course in visual basic, Mister Reyes, the small learning community coordinator, assigned the course to Ian a few days before the start of the school year. Additionally, Ian was asked to teach a basic technology course. Neither of the courses had a curriculum, an organizing framework, or even a set of objectives. Also, no one in the school had taught either of the courses before. Consequently, there were no instructional resources that Ian could use as a guide for his planning and teaching.

Ian also found that the technology resources in the school were old, outdated and damaged. All of the computers were close to ten years old and many of them were lacking parts or had been corrupted by viruses. The computer lab itself was dirty. Beth's field notes from her initial visit to the lab offers a vivid description of the space.

> Today I am sitting in Ian's technology class. This room is incredibly huge and incredibly hot. The first thing you notice is how messy it is. There is trash littered everywhere. Ian told me earlier that the janitors do not come in here—they claim that they do not have keys. The bland, beige walls and florescent lights are oppressive. This is compounded by

the fact that there are absolutely no windows in the room since it's in the interior of the building. The students are using PCs that are probably ten years old. The room is a large square; two large heating and air conditioning units consume one corner. I guess they are heating units since the air conditioning definitely is not on! There are approximately 25 computers lined up in an L-shape that flank two sides of the room. Random tables are scattered between the two L-shaped rows of computers. A large rolling whiteboard sits in the middle of the room. There are also student study desks in another part of the room that you would find in a library. Two large, metal closets that are locked with chains sit in another corner. (Beth, field notes, 4/29/05)

For the basic technology course, Ian had no curriculum or textbook. Although the course was another source of stress for him, he was at least able to come up with some meaningful activities for the students, since it was a basic level course.

In the [technology] class I did a lot more fluffy stuff. Like I had them do a lot of investigations on the Internet about technology in general, they made web pages, they thought up technology-based inventions or products, and we even did some things with Word like creating tables and doing other things. But really I had nothing as far as resources. (Ian, interview transcription, 6/18/05)

On the computers that worked properly, there was no software available for Ian to effectively teach visual basic or any other programming courses. Nonetheless, he decided to do the best he could by changing the course objectives to better suit his experience and the resources he had available. He found that the computers did have the Robolab coding software installed. Also, City High School had a number of Lego robot kits that Jack had purchased for the school or had received through donations. In addition, Ian had purchased several kits for the robotics club he had tried to begin at Leach Learning Academy the previous year. Since he had purchased the kits with his own money, he had taken them with him from Leach Learning Academy. Based on the resources he had available, Ian changed the visual basic course to a robotics course, even though this disappointed some of the students.

I had to teach both courses with nothing to use. There was nothing on the computers besides Robolab. No coding software. No compilers. Just nothing. Of course, I find this out a day before the school year starts. So I stared doing robotics, because it's essential programming, instead of visual basic. And the whole time the students were asking, "Why aren't we doing visual basic?" (Ian, interview transcription, 6/18/05)

Because of the lack of resources available to teach visual basic, Ian reframed the course in a way that better suited his knowledge base and the material resources he could access at City High School. This was unfortunate for the students who had hoped to take visual basic, but Ian felt it was the best possible solution under the circumstances. Throughout the first semester, Ian focused primarily on teaching robotics in what was supposed to be the visual basic course and slowly began to develop a robotics curriculum.

Ian's decision to restructure the class stemmed partially from discussions with Jack, who previously had worked with the Lego robots. Jack, and Ian both felt the Robolab programming software was a prefect introduction to coding even though it was not a traditional language. They figured that Ian could use the Lego robots as a way to introduce computer programming and technology with both of the technology classes. Throughout the courses, he stressed the programming over the design and construction of the robots.

The students generally used the basic robot design spelled out in the Lego robot instructions and concentrated on solving problems through clever coding, as opposed to physical design changes. Ian's plan was effective to some degree and the visual basic class progressed to programming with visual basic toward the end of the semester using free software from the Internet. As the semester came to a close, Ian began to organize all his notes and work to prepare for the subsequent semester when he would be teaching an actual robotics course.

The unofficial lab supervisor

Because he taught two technology courses during the first semester and a section of robotics during the second semester, another responsibility that emerged for Ian at City High was that of computer lab supervisor. Technically, no one else in the small learning community was in charge of the computer lab, and only a few other teachers had a key to get into it. Two of Ian's classes were held in the lab, which meant that he was physically present in the lab for half of the school day. Students depended on Ian to get into the computer lab; in some ways he became an unofficial gatekeeper.

> And at [City High School] I had kids constantly coming to me for things. I was doing things for the kids more. Like with the computer lab, they had to print something, so I had to bring my key and open up the computer lab for them. And it wasn't my job to do that, Mister Reyes said, but then I felt bad. But [the students] thought I was in charge. Because I had the key—not too many teachers had the key to it. And I guess they just felt comfortable asking me. (Ian, interview transcription, 6/24/05)

Ian's possession of the computer lab key became an issue because of the responsibility that emerged as a result. If a student needed computer access, he or she would come to his classroom and ask him to open up the lab, which was down the hall from his room. This often interfered with Ian's lunch, his preparation time, or his one-on-one tutoring with students. Mister Reyes had told him that allowing students access to the lab was not his responsibility; however, Ian felt that he had to help them, even if it interfered with his work or personal time.

Although Ian rarely complained about his two new major responsibilities at City High, it did truncate his agency and creativity during his second year of teaching.

Beth: Did these responsibilities affect your teaching?

Ian: Yeah, definitely. At Leach Learning Academy I had more time to prepare during the day, like to make copies. Eat lunch; I could usually eat lunch without interruption at Leach Learning Academy. But I just felt like I was running back and forth between the computer lab—making sure that was cleaned up. A lot of times I had to wait to get kids out of the computer lab when kids weren't finished. Also, some kids didn't want to go to lunch so they hung out in my room.
(Ian, interview transcription, 6/24/05)

Overall, Ian felt that his level of involvement increased significantly at City High School. He taught most of the students in his small learning community, and those he did not teach got to know him when they needed access to the computer lab. In addition to these particular responsibilities, Ian felt that he was generally more a part of the community at City High:

At City High I guess I had more of a sense of involvement. At Leach Learning Academy I was tucked away, I felt way more separated from the rest of the school. Aside from the computer lab, students were always asking me for letters of recommendation at City High—I had to write a bunch of those this year. At Leach Learning Academy I didn't. And the small learning community design was more structured, so I felt like a part of that group. I couldn't even tell you who was in my small learning community at Leach Learning Academy. (Ian, interview transcription, 6/24/05)

Both the small learning community structure and Ian's relationships with the students in the SEM^2 small learning community fostered a greater sense of involvement. However, his new responsibilities, which were strongly connected to his involvement in the community, hindered his creativity in lesson planning and his ability to tutor students during his free time. Because he spent a lot of time trying to find activities that would be appropriate for the technology

courses, Ian could not dedicate as much time to planning creative, engaging activities for his physics class, which he taught in the afternoon. Also, Ian generally spent his lunch breaks and after school time tutoring students. When students needed access to the lab, he would have to interrupt a tutoring session to let them in and at times, supervise them. Thus, the structures at City High School were highly distinct from those at Leach Learning Academy. The expectations and schema within the institution was that within the small learning community, Ian would take on certain roles and responsibilities above and beyond those he had come to expect over his year at Leach Learning Academy. As he became more involved in the small learning community and more students got to know him, his responsibilities expanded even more. Thus, Ian's new roles and responsibilities at City High as a member of the SEM^2 community directly affected his agency.

The dynamic nature of an urban high school

Even though Ian had mixed feelings about returning to City High, he was happy to return to his work with Jack, Mister Reyes, and other members of the small learning community. During his student teaching, Ian found that the school itself had many organizational flaws, however he respected the principal and felt that his small learning community and the larger context of City High was a good fit for him. However, upon his return, he found that the school had changed in many ways. During the year that he was at Leach Learning Academy the school's principal had left. As a result of the organizational and administrative changes at the school, Ian encountered a much different environment than the one he had left. In this section, we elucidate some off the changes and issues that Ian and his students discussed.

"Loud kids, disrespectful children"

Most of Ian's students mentioned a change in the school that had occurred over the last year or so, however, many of these comments referred to a general change in student behavior. For instance, Maya, one of Ian's robotics students, talked about some of the problems that she had witnessed since coming to City High School.

Beth:	What do you think about the school in general?
Maya:	Well, when I first came here, this was the best school. Now, everything's so messy.
Beth:	What do you mean by "messy"?

Maya: Like, the other kids downstairs, they come up and vandalize upstairs just because we're the motivation (small learning community). And I don't think that's right. That's why we had assemblies about the behavior in this school and the violence. Because it's getting out of hand nowadays.
(Interview transcription, 6/5/05)

In the interaction above, Maya distinguished between the way things were at City High when she first came to the school. Two years later, Maya's major complaint was the behavior of the students. However, she believed that her status in the science, engineering, math, and motivation small learning community, which she referred to as "motivation," put her in a different category than other students at City High School. She claimed that students in other small learning communities ("the other kids downstairs") were responsible for the problems in the school. Maya also brought up another issue in response to a question about safety in the school.

Beth: Do you think it's a safe school?
Maya: No. Well, it's a safe school, but people come in here with any type of thing. Like, I can get in here with my phone. My phone don't beep. So imagine the things that can't beep that kids can come into school with. And the other day, you know how you got a pen? They got knives in pens, they don't be checkin' pens. What they looking for is big things like guns, but people aren't gonna bring them to school, I doubt.
Beth: What about drugs?
Maya: Drugs, the girls and the boys be smokin' weed in the bathroom. I don't know how they get it in, but I don't know.
Beth: The security guards don't check?
Maya: No. When we get into school, basically I take off my jewelry and my jacket. The machine don't show, I don't think the people really be lookin' for things like that. Like they look for lighters, anything that's metal. That's all they look for. So if I beep, they gonna tell me to take of something else or they gonna check me. They just do this. ((*She pats herself lightly*)) So you can get in here with any and everything.
(Interview transcription, 6/5/05)

Aside from the students' behavior in the school building, Maya also felt that her safety was compromised by the metal detectors' inability to detect her cell phone; this meant that other potentially dangerous items, like weapons, might get through. Interestingly, she talked about the students' marijuana use in the bathrooms as something that was extremely commonplace and unworthy of concern. It was not clear, however, if these issues had become increasingly

problematic only recently at City High School. However, her commentary provided and interesting student perspective on the general climate and culture of the school.

Travis, an eleventh grade student in Ian's algebra class, talked about the increased violence at City High School.

Beth: How do you think the school has changed since you've been here?
Travis: There's new students comin' in and a lot of them fighting and all that. That's about all that's changed.
Beth: How do you think this school compares to other schools in this city?
Travis: I think a lot of the schools here are the same: loud kids, disrespectful children.
(Interview transcription, 6/5/05)

For Travis, the students were a major problem in the school. He felt that their behavior had gotten worse over the last year or so. Travis did not believe that City High School was any different than other schools in the city since they all enrolled "loud kids" and "disrespectful children." In addition to increased fighting, many students mentioned the fires that had been started in garbage cans throughout the school. For instance, in one cogenerative dialogue, Gary discussed the fires that had recently occurred. However, Gary and other students attributed the problems to other small learning communities in the school—those that were housed on the other floors.

Ian: What about the other floors? Do you venture down and wander around the other floors?
Dexter: Yeah.
Nikita: I get lost on the second floor. I don't like the second floor.
Gary: I like the third floor better than any of the other floors.
Dexter: The third floor commons.
Gary: Cause they be on the first and second floor they be doing crazy things.
Dexter: ((*Laughs.*))
Gary: Like one day I was on the first floor in my class. They took and set the trashcan on fire. Right while I was down there. That's why I don't like the school like that. They're crazy.
(Cogenerative dialogue, video transcription, 6/5/05)

Most of Ian's students had mixed feelings about the safety of the school. They claimed that they felt safe, but qualified their answers with an anecdote about something negative that had recently occurred. Most felt that the changes in the school and its disorder were connected to the administrative changes that

had occurred over the last two years, since Ian had left City High after student teaching.

Changes in leadership

Harmony, a student in Ian's bioengineering course, believed that the changes within the school could be attributed to the principal change. She claimed:

> [This] year had the most change because the principal. We don't have a principal right now. This year the schedule changed, so we get out earlier. This year was the most change. But last year we changed principals too. (Harmony, interview transcription, 6/5/05)

During student teaching, one of the aspects that Ian liked about City High School was the organized administration. At the time, Ms. Henderson had been the principal for several years. Although Ms. Henderson was strict with a no-nonsense attitude, the students respected her and felt that she was a good leader for City High School. However, over the summer, Ms. Henderson was reassigned to another district position. Ms. Jacob, who had previously served as the vice principal under Ms. Henderson, was promoted to the principal position. When Ian returned to City High School, Ms. Jacob had been principal for one full year. He found, however, that the school under her leadership was disorganized and there was little unity among the teachers and administrators. According to Ian, Ms. Jacob attempted to do things like Ms. Henderson, but "she could not pull them off." Whereas Ms. Henderson was loud, flashy, and strict, Ian felt that Ms. Jacob lacked authority and was inconsistent with school policies.

In March of the year that Ian returned to City High, Ms. Jacob was also reassigned and left the school. Although there was no formal explanation given for the midyear administrative change, Ian and some of the other faculty thought that it was connected to a huge fight that occurred in the school one day. The next day, Ms. Jacob was gone. Immediately after that an interim principal was brought in. Previously, he had been sent to a few other neighborhood schools in the district to fix their organizational or administrative problems. Ian thought it was odd that the interim principal did not make an effort to get to know the staff or to introduce himself to the school community. Ian saw him for the first time after he had been at the school for approximately one month. Even by the end of the school year, Ian had not met him.

As a result of the administrative changes, Ian felt that the school culture had changed. The amount of security and supervision in the hallways was a significant

issue. When he was at City High previously, there were security guards that walked the halls to make sure that students were in class. However, upon his return, he found that this was no longer the case. Students were in the hallways at all times, and frequently students would come into his classroom while he was teaching.

> A day would not go by that a random student would open up my door, poke his head in, and just look around. Most of the students were not from my floor—they were from a different small learning community and had just wandered into our area of the building. Generally, these kids would just look around and then leave. Sometimes they would come in, sit down, and act like it was normal to just sit in a class in which they did not belong. I would have to go over and ask them to leave, which they would usually do, but maybe once a week it would escalate into some sort of verbal confrontation. It was very frustrating to me and to the students in my class. I came to believe that some students viewed school as purely entertainment and as a social scene with only the norms of a party to govern their actions. One solace I had was in the fact that the students in my class were confused by these actions as well; I would often ask them if this kind of thing was normal and/or why would people just come to school to hang out and it was comforting to hear that they didn't understand either. (Ian, written narrative, 7/1/05)

Ian's practices: Moving along in his second year

Most of the data we collected during Ian's second year in the classroom revolved around his teaching practices and his work with students. In the sections below, we describe the patterns that emerged surrounding his practices during his second year of teaching at City High School. Focusing mainly on data collected in his algebra II and robotics classes, we found that Ian continued to build relationships with students. He also continued to help students individually during and outside of class, and challenge students' perceptions of mathematics by engaging them on hands-on activities. Ian also had an opportunity to expand his practices through his work on the robotics curriculum and through teacher research. After describing the patterns that emerged in our data for year two, we set the stage for the argument we build in chapter eight with regard to Ian's practices over several fields.

Building relationships with students

During his student teaching and into his first year, Ian continually expressed an interest in building relationships with his students. He felt that by getting to know his students, he could build on their interests and life worlds in the

classroom. He could also use the social capital he established with them as exchange value for their engagement in learning activities. On a more intuitive level, Ina also enjoyed being a mentor and confidant to students, especially since many of them had experienced adversarial relationships with teachers in the past. He enjoyed challenging students' thinking about teachers' roles and the ways in which teachers and students typically interact.

In his second year, Ian continued to build relationships with students at City High School. However, he became much more comfortable in interacting with his students, and often engaged with them in ways that reflected his personality, for instance, by joking sarcastically with them and by teasing or "playing" with them. In this section we describe three practices that supported Ian's ability to build relationships with students: his one-on-one work with students during class time, through his open door policy and in extra help or tutoring sessions.

Help broadly defined: Working with students one-on-one

Out of all of our codes in the textual data, the pattern "helps students or tutoring" emerged the most. Many of the comments from the anonymous survey we distributed to students specifically addressed this practice:

> He helps me whenever I ask for help and when I feel lost, nervous, or if I sleep he would encourage me and help me (Jay, Algebra II). When you ask for help he is right there to give it (Taneesha, Algebra II). When I raise my hand he comes over and helps me out with my work (Alex, Algebra II). I know when I need his help he come right away and explain the problem until I understand it (Cynthia, Algebra II). He comes over to the table and makes sure you understand what you are doing. Go over the problems that may be difficult to you. (Marcus, Robotics) (Impromptu interview transcriptions, 5/18/05)

Most students that completed the survey felt that Ian helped them individually to better understand the concepts. For some students, like Jay, who is cited above, motivation was a key issue, especially during an 8:00 A.M. Algebra II class. Additionally, Ian provided not only help at the individual level, but also a source of motivation to actually do the work. He did this by responding appropriately to Jay in various situations—when he was "lost, nervous" or even sleeping. Another student also mentioned the importance of having Ian as a motivator. In response to the question, "What activities helped you to learn math the most?" he claimed, "There wasn't any activities that help me learn better. It's just that he stayed focused on me so that I want to learn" (Jay, interview transcription, 5/18/05). Both of these students' comments indicate that Ian's help and motivation enabled them to be productive, engaged learners in the

classroom. The other students quoted above also mentioned Ian's expediency in helping—all of their comments indicate that Ian was there to provide prompt feedback or guidance and to attend to their specific needs.

Marcus, the last student quoted above, mentioned specific moves that Ian performed as he helped or worked with students individually during class time. These steps were confirmed by the video data. Ian spent the majority of the class time repeating the same routine again and again when helping students individually. He first got close physically to the students by sitting in a student desk or by crouching down next to a desk. He then would ask questions about what the student had accomplished and what he or she specifically was having problems with. Then Ian had to assess the situation. If possible, he would continue to ask questions to foster students' thinking about the problem or the question. If he got the sense that a student was too lost, he would provide step-by-step direction.

The students' interview and survey comments suggested that all of Ian's classes were run in the same way; he was equally interested in helping students out individually or breaking things down for students regardless of the subject matter. Harmony, a student in Ian's bioengineering class also mentioned his clarity and willingness to help students:

Beth: How is this class different than other classes you've had before?

Harmony: We do more hands-on work and more projects. It's not just sitting, being lectured to. Mister Stith, he teach it, you understand it—everybody in the class understands it-it's not like my math class where like half of us understand it. But I think that in bioengineering, we all understand it, and when we don't understand it he breaks it down even more for us.
(Interview transcription, 6/5/05)

Harmony did not emphasize Ian's strategies for instruction aside from his extensive use of hands-on and project-based activities (Figure 7.1). However, her statement support the claim that Ian spent a lot of time providing clear, sometimes individualized instruction based on his students' needs. An important element for Harmony and other students was his ability to break down the subject matter in ways that the students understood. For Harmony, this was a central aspect of the course that separated it from the instruction she received in her math course with another teacher.

Although Ian's class structure, which focused on time for one-on-one work, was quite similar to his work over the previous two years, he encountered a few subtle differences in year two.

Figure 7.1. Ian helps students with a hands-on math activity.

Beth: How did your individualized attention and/or tutoring change in year two?

Ian: With tutoring this year I had a lot more students from other classes coming in. Or the students I had would bring me problems from other classes. I think I tutored more this year but there were fewer kids that stayed after school, which was sort of weird. It was more often that kids would come after school at Leach Learning Academy. Here at City High, they would always come during lunch.

Beth: Did what you did in these tutoring sessions ever impact your work in the classroom?

Ian: Yeah, definitely. It was just another way to assess understanding, you know. I could go over things again so that I could evaluate how a lesson went or an activity or something, unless it was a kid from another class. But then I still got something out of it if it was a student in another class. It made me aware of what other teachers were doing. If it was a class that my kids would have next year, then I would at least be aware of what they would need to know. Because you don't always get a sense as to what the kids are going to need to know.
(Interview transcription, 6/6/05)

Because Ian realized that attending to students' needs on an individual level was effective and appropriate, he structured the practice into each of his classes. He also made himself available as much as possible during the school day so that students could come during lunch or during a free period. Thus, his role in the classroom became more of a facilitator and tutor, helping students when needed. Similar to previous years, Ian found that doing this enabled him to establish symbolic capital with students; most saw him as a caring, responsive teacher who was concerned with meeting their individual needs. The data also revealed, however, that some students had not much experience with caring, helpful teachers.

Contradicting other teachers' practices

Some students chose to describe Ian's practice in terms of converse attributes or practices, similar to Shakeem's analysis of Ian's practices that we described in chapter three. That is, rather than identifying Ian in terms of what he "is" or "does," they talked about ways in which he contradicted other teachers' practices (Figure 7.2). For instance, one of Ian's Algebra II students claimed,

> Straight to the point, Stith is not one of those teachers that talk for about fifty minutes telling you about something. He tell you what to do, how to do it, and you do it. If you need help he will help you. (Robert, Algebra II, Impromptu interview transcription, 5/18/05)

In Robert's description, he outlined teacher practices that were atypical of Ian's classroom. He described characteristics typical of a lecture-oriented, teacher-centered classroom in order to illustrate the difference between teachers that "talk for about 50 minutes" and Ian, who is "straight to the point." Maya, a student in Ian's robotics class, also described teachers that were quite different than Ian.

Beth: What are some ways that this class is different than other classes at City?

Maya: He's clam, he's patient, he's nice. Like, when you ask him questions, he would try and answer them to the best of his ability. That's what I like about it. You have some teachers look at you like, "just try it and see what you get." And how am I gonna try it when I don't even know how to do it? So basically, when I ask him questions, he helps me. So he's a cool teacher.
(Interview transcription, 6/6/05)

Figure 7.2. Ian differentiates his instruction for two English language learners in his Algebra II class.

Maya's answer indicates that she had tried to seek help from teachers in other courses; however, she was not able to get the types of responses that she needed to better understand the material. Her teachers' attempts to foster her problem-solving skills by forcing her to think about the problems backfired, possibly because she did not have the foundational skills to do this successfully. With Ian, however, Maya received the help she needed to really understand the material. Because of this, in Maya's eyes, Ian earned his status as a "cool teacher."

In response to the same interview question, another student, Travis, also distinguished Ian from other teachers. Additionally, he used language that indicated that Ian had a distinctive level of caring.

Beth: What are some differences between Mister Stith's class and other classes you've taken at City High School?

Travis: He's focused on the students trying to get them to learn. The other teachers, they don't care too much. They feel as if you don't do the work then that's on you.

(Travis, interview transcription, 6/5/05)

Travis made a connection between Ian's willingness to help students understand the material and his sense of caring for students. Both Maya and Travis seemed to dislike teachers who stressed autonomy in problem solving. However, it was not clear whether the teachers they had experienced were attempting to foster independent or cooperative critical thinking skills, which caused their frustration. Nonetheless, Maya and Travis's comments indicate that Ian's help was a benefit to their learning when they were struggling with a problem or activity.

In essence, Ian spent the majority of the instructional time during the period working with students individually, just as he had over the previous two years. This practice enabled him to meet his goals in three specific ways. First, it enabled him to avoid lecturing. Ian often claimed that he did not feel comfortable lecturing in interviews over previous years. During his second year, he did not feel any more comfortable giving whole-class direct instruction, unless absolutely necessary.

> I still have not made up my mind about lecturing, but what I do know is that it is difficult to keep the attention of thirty sixteen-year old students for ten minutes, let alone ninety-six minutes. I not a fan of passive learning and maybe it is because I don't learn well that way, but honestly I am a firm believer that in order to learn something one must simply go out there and do it. Just as a teacher cannot learn to teach by watching an instructional video, high school students cannot learn math or physics by watching me perform experiments. (Ian, written narrative, 5/1/05)

> When I'm lecturing I can't really read the kids as well. When I'm working with them one-on-one, I can read their cues and figure out if they know it. I want the students to give me instantaneous feedback. Like if I'm explaining something to you personally, right now, we could discuss it. But if I'm up at the board, everyone would be talking over one another. I do lecture I guess in a math sense, but never for very long. Fifteen minutes max. It depends on the class. I just didn't feel it was effective. It's just me I guess. I lectured more this year, definitely. I thought the classes were more structured this year than last year in a traditional sense. I guess because in math, I felt more compelled to follow the standardized thing. (Ian, interview transcription, 6/6/05)

Second, by focusing on students individually or in small groups, he could differentiate instruction based on students' needs. Similar to Leach Learning Academy, Ian found that at City High School, students had come to his Algebra II class with different backgrounds and skill levels in math. Ian could assess a student's needs at a particular moment and then help the student solve the problem. Third, during these one-on-one or small group interactions, Ian could work

toward his goal of building relationships with students. By this point, Ian realized that in most cases, the students were unaccustomed to receiving such personal attention from teachers. By dedicating time to each student individually, he demonstrated that he cared about each of his students' success. Thus, Ian's embodiment of an "ethic of care" (Noddings, 1984) in his teaching was clear to the students. The students' perception that Ian was a friendly, caring, helpful teacher enabled him to build both symbolic and social capital, which he could ultimately use as exchange value to get the students to participate in learning activities. It is important to note that the individual work he did with students in class was often supported by his open-door policy with respect to tutoring, which we describe in the following section, and vice versa. These practices and consciously built structures mutually supported one another.

Translating practices to the robotics classroom

In the robotics class, Ian gave the students extensive freedom to work on their own. Each day, Ian would give them a challenge that they would have to accomplish with their robots. Individual students or pairs had created with robots with Lego parts using the Robolab software. The students' ability to perform the challenge successfully and depended on the efficiency of their design. Each challenge was a mini-competition; students would compete by accomplishing the challenge with the fastest time. As they assembled their models and talked about design variables, they naturally called him over for help when questions arose.

One student, James, explains to me how they created their robot and what they've added to the design to get it to perform the function. In this case, the robot has to knocking over all of the cans in a circle that Ian has created with tape on the floor (Figure 7.3). The robot design that does this task in the shortest amount of time wins. Just like in other classes, Ian walks around as a facilitator. Sometimes he times students with a stopwatch as they perform their challenge, then he observes what they're doing. He says very little. Everything, however, is hands-on. The students seem to know that if and when they have a question, they can call him over. They do this every once in a while. (Beth, field notes, 4/29/05)

Fortunately, Ian had taught two technology courses during the previous semester and he was able to draw from experience with those classes to design a longitudinal set of plans. Whereas for those classes Ian stressed the computer programming aspect, he chose to focus this class on the design and construction of robots. To accomplish this, Ian began the class in a much more formalized

Figure 7.3. One of Ian's students prepares his robot design for a challenge. The robot must knock over all of the cans in the circle.

manner than he did with technology classes and gradually allowed the students to explore their designs more creatively.

During the beginning of the semester, Ian spent the whole period in the classroom working with the robotics students on teamwork. To introduce programming, and for the students to begin to understand the challenge that robots present, he first had them program one other as if they were robots. The students and Ian decided on a language they would use to program each other; for example, saying "right leg forward" caused the robot person to move their right leg one step forward. This introduction allowed the students to move gradually to programming the Lego robots.

Ian then used the same challenges with the robots that the students had done with each other as the first assignments. Thus, the students only needed to translate the language from the code they had previously designed to the Robolab code. Eventually the students moved beyond these preliminary challenges and began to try more advanced projects. For example, in one of the challenges, the robot had to lift an aluminum can from the ground and place it on top of a few books. This challenge required the students to design a lifting system as well as a grabbing system. Projects like this allowed the students to go through the design cycle of testing and redesigning as if they were real engineers working on a robot (Figure 7.4).

Figure 7.4. James watches as his robot completes the challenge. Ian observes (far left) and another student times the challenge.

This approach of student exploration was critical to Ian's work with the robotics class. As described by Ian in this excerpt, his goals with the engineering and robotics classes mainly centered on student agency and structuring his class in a way that maximized students' ability to access to resources to solve problems.

I really want the students to start to think like engineers and challenge themselves. My dream is to just put out the pieces and let the students just build and build. It is hard sometimes because a lot of the students are used to constant judging by the teacher and peers. It is hard to get across the concept that failure and revision are good things. So in that light I think a class like this is perfect for them to begin to explore and maybe find a new interest. (Ian, journal entry, 4/10/05)

Designing the class around projects and challenges allowed the students to work together or individually toward a goal. Most times, it also avoided them relying on Ian for direct answers and for solutions. However, his heavy use of cooperative learning in the class allowed for more opportunities to work one on one with the students and to assess their understanding in individualized ways. At the end of each challenge Ian would have each student fill out an evaluation of the members of their group and for themselves. The goal of this exercise was

to develop the students' sense of self-reflection. Ian included self-assessment into the final for the robotics class for similar reasons. Throughout the course of the semester, Ian continually strove to build community in his classroom and encouraged the students to work cooperatively.

Ian's open-door policy for tutoring and beyond

Another way in which Ian built relationships with students was through his open-door policy. Day after day students stopped by Ian's classroom to talk to him about nonschool-related issues, to ask for tutoring or extra help (even if they were not in his class), and to ask for favors. For instance, on one visit to Ian's classroom, Beth took the following field notes:

> Today I stayed in Ian's classroom between the end of his Algebra II class and into the end of his Robotics class. Both classes have already taken their final exams, so the school year has all but officially ended. As we wait for the new period to begin, Ian has about 30 minutes. During this time, he allows two students to work on his computer. Another student, Harmony, sits in a student desk and reads a novel. When I ask her why she's here, she says she doesn't want to go down to the lunchroom, so Ian's lets her sit in his classroom. Two other female students come in, sit down and talking and giggling. I ask the students why they have come to Ian's classroom, and one of the girls says that she and her sister (who doesn't have Ian as a teacher) sometimes seek help from Ian in math. Today, however, they're just hanging out because they also do not want to go down to the lunchroom. (I start to wonder what goes on in the lunchroom!) Over the course of the half hour, students pop in incessantly to say hello to Ian or to ask him something. About half of the time, Ian "plays" with the students by teasing them. (Beth, field notes, 6/9/05)

As the year progressed, Ian found that more and more students would come to him as a resource for help in math and physics. Ian offered to help students whenever he was not teaching, which meant that he would usually tutor students each day during his lunch hour and after school. He typically ate the lunch he brought from home during a tutoring session. Students also came to him for help in other classes. For instance, some of the students that Ian had in his first semester physics class came for help with math during the second semester. Many of these students felt that they were not getting the help they needed with their new teacher. One morning, when Beth was into the school to visit Ian's classroom, a parent initiated a conversation with her about her son's experience with Ian.

This morning when I came into City High, I was signing in to the building when a woman commented about Ian. There was another woman, who appeared to be a parent, waiting to enter the building. Both of us had to sign in and show the security guard our identification at the door to enter the building as visitors. When she heard me say the name Stith, she said, "Oh—Mister Stith, he's such a good teacher! I wish my son had him again. He helped my son out so much." I asked if her son had had Ian in the past. She said he had Ian during the previous semester and he was always willing to help him. Even now, she said, her son goes to him for extra help even though he isn't in his class anymore. (Beth, field notes, 5/31/05)

There were several students in particular that Ian began to tutor on a regular basis. For instance, Harmony, an eleventh grade student in Ian's second semester bioengineering class, began coming to Ian regularly for help in her math class, which was taught by another teacher in the small learning community. In an interview, she described why she sought help from Ian:

Beth: What class do you have Mister Stith for?
Harmony: I have him for bioengineering at the end of the day.
Beth: So you don't have him for math at all?
Harmony: No, but he help me with my math. I have elementary functions and he helps me with it, like during this period and during fourth period.
Beth: You have a different teacher for elementary functions?
Harmony: Yeah, I have Miss Ward.
Beth: So you get him to tutor you?
Harmony: Yeah.
Beth: So why do you come to him for help?
Harmony: Because he help me understand things better. He break it down for me on the level that I need it. Miss Ward, she don't even break it down. It's an advanced class so she thinks we should all just know it.
(Interview transcription, 6/5/05)

Harmony had gotten to know Ian's methods as a student in his bioengineering class. However, she drew on him as a resource for her elementary functions course because of his ability to "break things down" and explain the concepts based on her specific questions. Similar to the comments made my Maya earlier in the chapter, Harmony felt that she needed someone to give her direct instruction on an individual level, which was out of sync with Ms. Ward's methods.

Harmony also went to Ian's classroom during her lunch period to avoid the cafeteria. During this time, she typically sat in a student desk and read a novel. Other times, she talked to Ian about things unrelated to class. She explained:

Beth: Why do you come in here and read during this period?
Harmony: Well I have lunch. And I don't like to go to the lunchroom. Fourth period I have foods class, but I don't go to foods no more, so I don't have nothing to do, so I come in here.
Beth: So Mister Stith is pretty good about letting you come in here?
Harmony: Yeah. I come in here usually when I need help. But since the school year is over I don't really have no work to do no more. So I just come in here.
(Interview transcription, 6/5/05)

Harmony took advantage of Ian's open-door policy for both academic and personal reasons. She utilized his presence as a resource to further her understanding in mathematics, for a space to read quietly, and to talk to a teacher who would listen. Toward the end of the semester, she came to Ian with questions about spontaneous combustion—a topic that her biology teacher had brought up in class. Harmony was intrigued by the possibility of humans spontaneously combusting, from both a scientific and a religious standpoint. Harmony was a fundamentalist Christian, and was having a hard time reconciling spontaneous combustion with her beliefs. Ian's talks with Harmony about the topic led to a conversation about religion, and later to Harmony's family life. Because she began to trust Ian, she began to feel comfortable talking to him about issues between her and her parents. Ultimately, these conversations were important to both Harmony and Ian; both mentioned them in interviews. In the following exchange, Harmony described her comfort in talking to Ian about topics that stretched beyond the limits of the classroom.

Beth: Do you talk to him about things outside of school too?
Harmony: Yeah. We had a conversation about, well I had asked him what spontaneous combustion was, like if it was true or not. And he was telling me about it, but he don't know if it's true. And we were talking about religion and stuff and my family and he was talking about his family.
Beth: So why do you feel comfortable talking to him?
Harmony: Because he's down to earth. Like he don't be acting like he's the teacher and you the students, like he's above you. Even though he's got authority cause he's a teacher.
(Interview transcription, 6/5/05)

Harmony's comments indicate that she was aware of the typical power differential that emerges between students as teachers—she felt that teachers are generally "above" students. However, Harmony found that her relationship with Ian went against the norm. Because she was not intimidated by Ian or did not feel as

though he talked down to her, she felt comfortable extending their conversation beyond science and aspects related to class. She opened up to him about her religious beliefs and some personal family issues she was currently having.

Ian also discussed his conversations with Harmony.

> I got the sense that she felt alone and didn't have anyone to talk about life stuff. She came in and started asking me about spontaneous combusting and then we were talking about that. And then it led her to ask questions about stigmata and then we started talking about religious fanatics. But I had also overheard her telling another student about being molested by someone in her family. She was talking really loud. So, that made me want to find out more about her family. And she told me that she can't trust men and that she doesn't like to be touched at all. I think it was good to talk to her about her family. A lot of it was the typical high school adolescent stuff. But, I think that our conversations made her want to find things out for herself. Like I was saying that I find it fulfilling to find out what different religions and different perspectives are all about. And then she said that she didn't want to look into [different religions] because she thought she'd be confused, and she likes things to be set and consistent. That's kind of what I wanted her to get from our conversations—that she should question things, no matter what it is. (Ian, interview transcription, 7/3/05)

Because Ian had built significant social capital with Harmony and because his door was always open, Harmony felt comfortable talking to Ian about other aspects of her life. Ian's rapport with Harmony illustrates his efforts to successfully build relationships across borders created by race, class, and gender. Through their conversations, Ian built a trusting relationship with Harmony, which they both deeply appreciated.

In some ways, Ian's open door became problematic. Since students came for tutoring during his lunch period, Ian rarely had a free moment to himself. Students also came during his preparation period, which meant that Ian had little time during the school day to work on his lesson plans, to grade student work, or to attend to other administrative issues. Additionally, at times, his open-door policy led to students stopping by not for genuine help, but just to be disruptive. Students sometimes stopped in while they were wandering in the halls to talk to other students in Ian's class or to simply disrupt his teaching, as he discussed earlier in the chapter. Other times, students stopped in during class time to get the key for the computer lab or to ask Ian questions about class. When such instances occurred during class time, Ian had to shift his focus from teaching to deal with the disruptive students.

Connections between relationships, one-on-one work, and open-door policy

As we discuss further in chapter eight, as we were analyzing the data and examining the patterns that emerged, we found it difficult to elucidate Ian's practices in isolation from each other. Essentially, other practices supported each of the practices we discussed. For instance, Ian's open-door policy directly affected students' access to him as a resource in many ways: for tutoring, for a haven from the chaos of the school, and for someone with whom to talk about aspects unrelated to school. Ian's open-door policy and the social capital he had built with students enabled students to feel more comfortable coming to him for tutoring. Most teachers had specific days and times in which students could come for extra help, however students knew that could get individualized attention from Ian when it was convenient for them. Also, because Ian focused most of his in-class instruction on working with students one on one, he became very skilled at reading students, assessing them on the spot, and providing appropriate, differentiated instruction. Thus, students started coming to him for help in other classes because of his keen ability to "break things down." Finally, Ian's in and out-of-class tutoring enabled him to build relationships with students simply because of the increased amount of time he could spend talking to them individually. Even if their conversations focused solely on mathematics, physics, or robotics, Ian's individualized attention made students feel as though he cared about them. By engaging in each of these practices, Ian was able to meet his overarching goals of building relationships with students and ensuring that each student understood the material. However, it would have been difficult for Ian to accomplish either of these goals in isolation.

Keeping students moving in mathematics

In this section, we discuss the patterns that emerged in Ian's second-semester Algebra II class at City High School. We chose to closely examine this class, rather than his robotics, technology or physics classes, in order to analyze his practices in comparison with those that emerged in his Core Plus III class at Leach Learning Academy. After describing some of the curricular changes that Ian experienced in moving between Leach Learning Academy and City High School, we discuss Ian's implementation of the mathematics curriculum, his work to reframe students' conceptions of math, and his use of hands-on activities.

Curricular changes

One of most significant structural impacts on Ian's teaching stemmed from the curricular changes that he encountered between Leach Learning Academy and City High School. Even though Ian was teaching eleventh grade mathematics at City High School, the school had adopted the College Prep Mathematics (CPM) program, which was quite different from the Core Plus program. The introductory materials describe the program as follows:

> College Preparatory Mathematics (CPM) is a complete, balanced mathematics program for middle school and high school students who want to learn the basics and more . . . CPM [College Preparatory Mathematics] includes a two-year middle school curriculum and a high school program of Algebra 1, Geometry, Algebra 2 and Math Analysis (Precalculus) accepted by every college and university in the country. CPM [College Preparatory Mathematics] students are prepared to know fundamental skills and procedures, understand concepts, and acquire an array of problem solving strategies so that they will be prepared to be successful in college mathematics courses and the workplace of the 21st century. In line with the requests of leaders of high-tech industries, College Preparatory Mathematics students learn to work together in study teams on challenging problems. Under the careful guidance of their teachers, College Preparatory Mathematics students explore the major concepts of middle school and high school mathematics in a variety of ways designed to provide them with several means to solve math problems. College Preparatory Mathematics students are assisted in making the transition to higher mathematics by doing problems, which illuminate concepts in four major ways: numerically, symbolically, graphically, and verbally. Deep ideas are spread over weeks or months as students engage and re-engage the same concepts in a wide variety of contexts and degrees of difficulty with frequent opportunities to cement their understanding of basic ideas and their intellectual connections. (College Preparatory Mathematics, Educational Program, 2001, p. 3)

The school district had developed a standardized curriculum around CPM, which Ian used throughout the year as a resource. He found both the CPM program and the standardized curriculum to be a nice change of pace.

Beth: Tell me a bit about the curriculum differences between City High School and Leach Learning Academy.

Ian: The College Preparatory Mathematics curriculum was much more standardized than Core Plus. I felt like I had to use the standardized lessons and materials that went with the text because the students had to take the corresponding benchmark tests, they had been created according to the text. And I wanted to try it since I hadn't used a standardized curriculum

before. And I heard it was good so I thought it was worth a try. Also, because of the time constraints it was easier just to use the standardized curriculum than constantly create my own stuff. I had to prep for multiple classes, which was much different than when I was at Leach Learning Academy. So it wasn't just one reason, there were multiple reasons.

Beth: What did you think about the program?

Ian: I liked the program, but the students were not prepared for it in that it was a third year course. It built on the fact that they had taken another two years of College Preparatory Mathematics, so there were certain methods within the course that students should have known. In the first two courses (algebra and geometry) they spent time teaching how the program worked and what a typical class was like. In Algebra II, they didn't spend any time teaching them what the course and instruction would be like, and they hadn't had College Preparatory Mathematics before, so it was different for them. Plus they didn't have the math skills necessary to do well. And for students who don't have any confidence with math, it's a very frustrating curriculum. It's good for kids who will do okay with minor setbacks. But my students were used to struggling with math and it didn't make them want to try and harder when they had a minor setback. It just infuriated them more. Anyway, I think it was a good thing, but it wasn't carried though the way it should have been.
(Ian, interview transcription, 7/1/05)

Although Ian liked the CPM curriculum, he realized that his students would need significant help to be successful with the program. For them, the program was an entirely new way of doing mathematics. Additional challenges stemmed from the fact that many of Ian's students had a weak background in math. Not only were they unfamiliar with the style and methodology of the program, they were not ready for some of the content that he was supposed to cover. For students who lacked prerequisite skills and knowledge and who were accustomed to a traditional math class, the CPM program was quite a challenge.

"I really don't know math"

On top of curricular and program-based issues, Ian found that his students' attitudes about algebra and math in general paralleled those of his students at Leach Learning Academy. Similar to the findings we reported from Ian's first year experience, many of his students at City High School felt that math was either too difficult, too boring, or both. Ian continued to wonder how and why students had grown to give up on math; he explored this question often in cogenerative dialogues. In one cogenerative dialogue, Ian invited two female students (Renee

and Missy) who were doing poorly in the class and one female (Taneesha) who were doing well to participate. Renee described her perceived strengths and weaknesses in the class.

Renee:	When it comes to puttin' graphs together, I can do that. When it comes to stuff like this, little patterns and stuff like that, I can do that. Like the easy, the basic stuff.
Ian:	[This isn't.
Renee:	[Stuff that I've been working on every year since math.
Ian:	This is new stuff.
Renee:	No, to me it's basic, it's easy.
Ian:	So you're getting confused. When you actually can do something, you say to yourself this must be easy for everyone else, but it isn't. You should be patting yourself on the back saying, "I'm getting it". Isn't that right, Taneesha?
Renee	It seem like it, cause–
Ian:	'Cause not everyone gets it.
Taneesha:	You see me smile when I get something. I'm like yeah. ((*Raises her hand, smiles*))
Renee:	That's why I don't do my homework. Because I can't. And then everybody, I don't know, can't do it
Taneesha:	Mister Stith, the reason I got your class is because I learn stuff in your class. That's the reason why I got your class, to tell you the truth.
Renee:	I don't necessarily call myself stupid. It's just that I don't get math and I don't want to sit around other people and they be like done. Because then I feel like in their head they lookin' at me like, oh my gosh.
	(Cogenerative dialogue, video transcription, 5/11/05)

Throughout the exchange, Renee downplayed the things she could do in math class and emphasized what she could not do. She continued to categorize the material she was comfortable with, such as graphs, as "easy" and "basic," even though it actually was new, and according to Ian, not necessarily easy for everyone in the class. Renee lacked confidence in math altogether and as a result, did not complete her homework. Additionally, Renee was concerned with what her peers thought about her in the class. She felt that other students would think she was stupid because she did not finish her work as quickly as others. Renee very clearly stated that she "did not get math," however, she was quick to point out that not knowing math did not make her stupid. Rather, to Renee, not understanding math or understanding only basic concepts was perfectly acceptable.

Later in the cogenerative dialogue, Ian tried to find out what had spawned the girls' disdain for mathematics:

Ian: When do you think that happened, Renee, that you stopped liking math?
Renee: I never liked, all right, when I stopped liking math was when I got to the seventh grade. And after I graduated from the sixth grade, we had this teacher Mister Abdul. And like, he used to do math that was real fun and then once I got to the seventh grade, I don't know why I just started hating math.
Missy: I never liked it. When it comes to math, like when you say open the math book, I just get narcoleptic, I be fallin' asleep. My eyes just close, I don't make it to the next section.
(Cogenerative dialogue, video transcription, 5/11/05)

For Renee, math had been fun until middle school, when she claimed to have started "hating" it. Missy, who rarely did any work in Ian's class, felt that math was overwhelmingly boring.

In order to make his class more fun and to supplement the ready-made curriculum materials, Ian decided to continue to utilize some of his creative mini-labs, projects, and other hands-on activities. To improve the course, however, he continued to ask students what they enjoyed and how he could improve it.

Ian: So how I do to make math more fun?
Taneesha: It's cool for me, I like it because it's the hands on projects like this.
Missy: It's just I don't know it.
Renee: It's not to say that you make it fun. It's not just you makin' it fun, 'cause it's cool, your class is cool. But it's, it's, I *just don't know it*. I need help.
Taneesha: You see me if I need help. I call you all↑ the time.
Ian: So we need to do more, am I right Missy, Renee, Taneesha?
Taneesha: I'm just gonna keep doing what I'm doing—I'll be asking you.
Renee: Anything with math don't stick. Like you could come to me and say do this, this, that, that, that.
Ian: You are trying though, Taneesha.
Renee: And then when you leave, and when you come back I'm like uh, uh.
(Cogenerative dialogue, video transcription, 5/11/05)

Both Taneesha and Renee reiterated that Ian's class was "cool." Taneesha mentioned that she liked the hands-on projects and often took advantage of Ian's individual help in the class by calling him over when she needed help. However, for some students, like Renee and Missy, it was difficult to take advantage of the hands-on activities and individualized attention because of their beliefs about their own abilities. Rather than talking about a specific concept that they did not understand, both Missy and Renee claimed that they did not know or understand

"it"—math in general. Renee in particular believed that she was not good in math and that regardless of her effort, she would probably not understand the lessons. Thus, similar to the students at Leach Learning Academy, many of Ian's students at City High School accepted their math illiteracy or expressed a strong dislike for the subject.

Using more hands-on and science-based math

Although many of Ian's algebra students at City High School held negative attitudes about mathematics in general, quite a few mentioned specific positive implications that stemmed from Ian's course. First, they felt that they understood the concepts better as a result of the class structure—specifically, because of Ian's clarity and individualized instruction. Ian continued to think of real-life applications for the problem-based math program, which the students generally enjoyed. In response to the question "How does Mister Stith help you to do better in math class?" one student claimed:

> Mister Stith's class really helped me to experience math problems and to use math in everyday life. Not only we learned from the book, we also listened how we can use it in life. (Student, anonymous survey, 6/15/05)

Just as Ian and Jack had done during coteaching, Ian began each class period with a pre-class problem. During pre-class, students were expected to come in and get started immediately on a problem that was written on the board. As the students worked, Ian would circulate and help students individually based on their questions. If Ian spent any time during the period lecturing, it would generally occur as a response to the pre-class problem, to introduce a new concept, or to give instructions. As we described previously in this chapter, Ian's class structure incorporated extensive time for students to work on problems (generally from the CPM text) or on hands-on activities in small groups, with partners, or alone. Ian usually let students choose others with whom they wanted to work unless a group was disruptive.

One of the ways Ian continued to reframe his class was by assigning projects that incorporated visual representations of math concepts. At Leach Learning Academy, he felt that some of his most successful lessons were those in which students got to see a mathematical concept using visual aids or three-dimensional objects. At City High School, Ian experimented with having students create representations of different math concepts. Fortunately, the CPM curriculum provided a few activities that Ian could build from or change slightly. However, Ian also created many of the activities on his own.

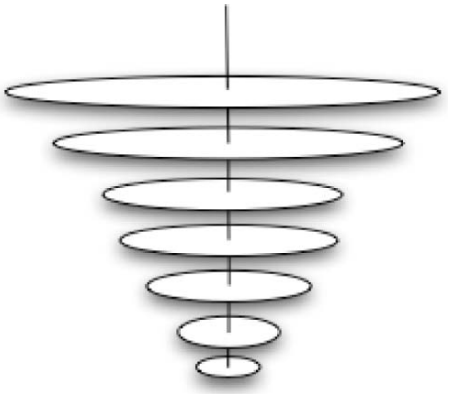


Figure 7.5. A representation of the three-dimensional graph that students created in Ian's mathematics class at City High.

A few examples of his most successful activities were the three-dimensional (3D) graph, the similar triangle model, and the pasta exponential graph.

The 3D graph consisted of seven concentric circles hung from a string (Figure 7.5). The radius of each circle ranged from one centimeter to seven centimeters so when hung together they made the shape of a cone. The objectives of this activity were to introduce students to parabolic curves, to review area, and to review linear relationships. The models were hung around the room as visual aids so the students could refer to them throughout the year.

The similar triangle models were basic similar triangle pictures but constructed vertically from a piece of paper, such that when the string was lifted from one corner, the other two corners stay taped to the paper. From this, triangles were formed vertically. This activity also gave the students the opportunity to work with their hands and build a working model. It also showed the students how much more difficult it is to build a pair of similar triangles with string than it is to simply draw the lines on paper.

The pasta exponential activity was another example of a concept presented in a traditional way but with a slight addition. For this activity the students drew exponential graphs from a CPM problem involving the value of a classic car and it's age. To emphasize the true nature of the relationship between the variables, the students glued down pasta from the x-axis up to the corresponding

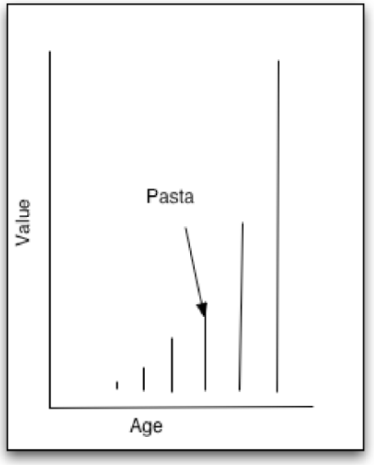


Figure 7.6. A model of the pasta exponential graph that students created.

point on the line, such that the result looks similar to a histogram with pasta as the boxes and an exponential curve as the behavior (Figure 7.6).

All three of these activities were connected to the CPM curriculum, so Ian felt comfortable adding them in despite the extra time they took. He felt the students' needs were not simply restricted to problem solving; they also needed conceptual work. However, such activities also led to deeper understanding of the abstract concepts in the problems. These activities also served as break from the text-based problems, which many students complained about. Since Ian was following the standardized curriculum in his math class, less time was available for him to incorporate creative activities. However, when he could incorporate hands-on, conceptual projects, the students enjoyed them immensely.

In addition to these visual activities, Ian also was able to incorporate some science-based activities into the class. For example, Ian was able to use the river activity and the tangent activity, described in chapter six. In addition, he created a few new activities that used experiments to present math concepts in an alternative way and to connect them to real life situations or examples. For instance,

he used the penny parabola activity, the pendulum parabola activity, and the noodle bridge activity to address specific mathematical concepts. Both parabola activities were designed to demonstrate how parabolic behavior can exist in real life and how one could measure and describe it mathematically. In the case of the penny parabola activity, the students threw a penny and traced its motion across a dry erase board. With the right throw a perfect parabola can be seen. Once a coordinate plane is drawn using the edges of the board as the x and y-axes, the motion can be formalized. Similarly, a pendulum makes a parabolic shape opening up as opposed to down like with the penny. When given a few points, the students were able to create an equation that described the motion.

The penny parabola activity, like the similar triangle model, took the shapes and numbers and gave them real meaning. Unlike a word problem on paper, these activities allowed the students to understand why the equation made sense in the context of the physical world. To make the concepts even more concrete, Ian often asked the students to make visual representations of their work on chart paper (Figure 7.6). He claimed that students enjoyed creating posters and they could then use them as resources when he hung them up around the room. Activities like these also allowed time for Ian to circulate and informally assess the students' understanding of the topic and address issues as they arose. He could easily point to the line and equation they had created and clarify problem areas while the rest of the class was fully engaged in their own work.

Although Ian continued to incorporate science-based mathematics activities, he felt that the standardized curriculum and corresponding assessments generally took precedence. Because he had resources such as ready-made lesson plans, problem sets and assessments at his disposal, at times he had no reason to generate his own teaching activities. Ultimately, the availability of the standardized curriculum suppressed Ian's creativity in both a practical and an ideological sense. On a practical level, it was much easier for Ian to use the materials that had been created specifically for the CPM Algebra II course. On an ideological level, there was the expectation within the school and the district that students should know the material within the curriculum and do well on the curriculum-based benchmark assessments. Therefore, Ian was expected to utilize the standardized instructional materials. Based on these forces, Ian made the conscious choice to follow the standardized curriculum. However, he made daily decisions about *how* he would use the materials as a resource rather than using them exclusively. This often resulted in him adding supplementary activites like the ones mentioned above, changing lessons entirely or rearranging the content based on the students' experience and comfort level with a given topic.

Ian's experience with the standardized curriculum is a prime example of his agency. He used the curriculum as a resource to meet his needs insofar as he knew that some of the materials were high quality and appropriate for his students. However, he actively changed some of the specifics of the curriculum so that he could incorporate some of his original activities and projects. He also made the CPM program more student-friendly when needed, whether it was by prefacing a lesson with introductory instruction, by changing a lesson entirely, or by breaking down the concepts or problems with students on a more individualized basis. Regardless of the way he changed the curriculum, his ultimate goal was that students would better understand the material. However, to accomplish this, he realized that students would need different levels and different types of support, depending on their background with math, attitude, and motivation.

Differentiating instruction and support

In year two, the differentiated methods that Ian used to teach and support his students in algebra became clear. As a result of his in-class individualized attention, outside of class tutoring, and through other ongoing informal and formal assessments such as student work and quizzes, Ian realized that for his students to be successful, they needed his help in many different ways.

In one cogenerative dialogue, Ian initiated a discussion about language in mathematics. Ian found that when he gave students a sheet with instructions on it, which he often used when he had students perform minilabs, students were often frustrated simply by the amount of words on the paper. Ian found that their reasons for this frustration were varied.

Ian:	It seems like there's the attitude for some kids for some kids that there's too many words. They go, "I'm supposed to read all this!" (Everyone laughs) and then they look at it like it's written in another language. Yeah, people look at it like it's in Chinese or something. ((*Students laugh again.*)) "What am I supposed to do with this?" So I say, "start at the top left."
Gary:	That's how I am sometimes.
Dexter:	I was about to say, I say that. But I always try and do something before I read the instructions.
Ian:	Right.
Dexter:	If I'm good at something, I always try and do it before I read the instructions.
Beth:	Oh, you try and start the problems before even reading the directions?
Dexter:	Yeah.

Ian: Yeah, I know that's the manly attitude. Don't stop for directions, right? I do the same thing, but what's up with that? Why do you think people do that? I'm just curious. Like why do people get so frustrated when the book has like a bunch of words in it?

Dexter: Because it seems like it tells you one thing and then you gotta keep on reading it and reading it and then after you read it you still don't understand it.

Nikita: Or you're just reading it for nothing. You don't know how to do it.

Beth: Did he show you how to do before you did it or did he just give you the sheet?

Gary: That's the thing though. Even if he does show us stuff. It seems like it's just runnin' out my mind. And I don't remember it.

(Cogenerative dialogue, video transcription, 5/26/05)

Each of the students in the cogenerative dialogue expressed different challenges with regard to words. Dexter, who considered himself a good math student ("If I'm good at something"), generally skipped the directions and started the activity because he thought he would be able to figure it out on his own. However, later in the exchange he expressed his frustration with having to continually read in math; he was most likely referring to the multiple step problems that Ian often gave them, which according to Ian, were challenging for Dexter. Gary, on the other hand, was generally quite confused by even the instructions on a given task. Because he suffered from kidney disease and was frequently absent from school for dialysis, Gary had fallen behind in math. Ian realized that for Gary to complete some of the problems without getting overly frustrated and giving up, he had to give him much more support than other students. At times, he would sit with Gary and walk him through a problem or the directions for a hands-on activity. Even if Ian modeled the instructions to the entire group, Gary claimed that they would "run out his mind."

Ian generally left Dexter alone to do his work, only helping him when he had a specific question. For Gary, Ian would offer much more extensive help and support. Later in the cogenerative dialogue, each of the students had an opportunity to express their preference for support and help in the class.

Beth: So would it be better if he did the problem with you first and then had you do it by yourself.

Gary: Yeah.

Nikita: No.

Dexter: I like how he be telling us what to do and then leaving us alone.

Nikita: Yeah, other teachers don't do that. They be babying us.

Dexter: Yeah–

Beth: So you like to figure it out on your own.
Nikita: [yeah–
Dexter: [Yeah–
Ian: That's good. I think that, I mean because some teachers are scared to do that. They'll say, "Well if you don't tell them what to do every step, they'll just do nothing". And then for some kids that is true. Like I'm not going to pick on someone in particular–
Gary: Me? Me?
Ian: Like some kids, if I don't sit there and go, now do this, now do this, then they're just going to sit there with blank stares, you know what I mean?
Gary: See that's what I be needin' him to do. That's the only way I can work right.
Ian: Yeah, but I think it's good to keep it different. Because I don't always give you the instructions on the piece of paper either. Sometimes I say just do this and you gotta figure it out.
Gary: Yeah but you ain't supposed to do that.
Ian: Yes I am. Why?
Dexter: That's even better than just telling us step by step.
Ian: See part of it, I think I agree with you guys and possibly Kevin, although he hasn't jumped in yet. ((*Points at Kevin*)) But the point isn't necessarily for you to memorize these equations and stuff. You know what I mean, Gary?
Gary: Yeah.
Ian: The point is more for you to figure out how↑ to figure things out.
Gary: But sometimes you need to memorize the equation to get the problem done.
Ian: I agree with you. But there's multiple levels here. There's you learning the equation. There's you how to follow instructions, right. There's also you learning how to figure something out even though I didn't tell you how to do it.
Gary: Well I think that I'm still stuck on trying to follow the instructions. ((*Everyone laughs*))
Ian: It could be—everyone's in a different place, right?
Dexter: Yeah.
Ian: So that's, you're right, everyone's in a different spot, that's true.
(Cogenerative dialogue, video transcription, 5/26/05)

Early in the interaction, the students expressed divergent opinions about what would be most helpful in the class. Gary claimed that he needed Ian to help him work through the problems and would benefit from Ian modeling sample problems before he started on his own. He believed that such close, deliberate support was the only way in which he could "work right." Gary got frustrated when

Ian gave them a problem without the support of an equation or a suggested way of solving the problem; he even went so far as to say that it was unfair ("you ain't supposed to do that").

Nikita and Dexter, however, disagreed. They felt more comfortable working independently on the problem. Nikita even felt that extensive help, support, or instructions were equivalent to "babying." Dexter mentioned that Ian's strategy of forcing students to figure out the problems using their own methods was appropriate and "better than just telling us step by step." To clarify his actions and legitimize the claims of all of the students in the cogenerative dialogue, Ian pointed out the different levels of instruction that occurred in his class. Although he ultimately wanted students to get to the more deductive level ("you learning how to figure something out even though I didn't tell you how to do it"), he realized that some students would need a more explanatory, direct instruction approach. At the end, Ian reaffirmed the need to know his students' strengths, weakness and special needs in order to ensure understanding. He succinctly summarized this point at the end when he said, "everyone's in a different place."

By working with students individually in class, Ian was able to ascertain students' needs and offer them the appropriate type and quantity of support. Through cogenerative dialogue, however, Ian was able to get a better sense of their perceptions of the class and in this case, of his teaching. This particular cogenerative dialogue shows that both Ian and the students came to new understandings about one another and the class. Additionally, it shows Ian's interest in using student perspective, and even more broadly, methods of inquiry, to inform his classroom practice.

Enhancing teacher research

Over the course of the year, Ian began to take a more active role in conducting teacher research. Ian was accustomed to the presence of researchers in his classroom; during his student teaching, a graduate student worked on a coteaching study in his classroom (see McVay, 2003), however his involvement in her work was minimal. During his year at Leach Learning Academy, he became more involved in Beth's research (see Wassell & Stith, 2005) and served as a teacher researcher in a science education research group. However, during his second year, Ian began to generate his own research questions, read extensively in his areas of interest and take a lead in the research for this book, and this chapter, in particular.

In the analysis of this set of data, Ian was more involved in both the data collection and coding. As Ian evolved as a teacher, his research practices also

became more refined. Although Beth continued to visit his classroom to videotape and observe, he began collecting data on his own by videotaping his classroom, taking field notes, writing in a journal, and conducting more cogenerative dialogues. Thus, the analysis provided in this chapter was more of a collaborative effort than the previous analysis chapters, in which Beth took slightly more of the responsibility. After transcribing the textual data that we both had collected, we did our initial coding (Charmaz, 2005) separately. We then discussed the codes we selected based on our own knowledge about the contexts of the data sets. We also sat together to watch the video data, looking simply for interesting moments that we had caught on tape. Essentially, during this analysis, Ian served in a more active role. He also gained experience using qualitative coding software and gained further expertise using digital video-editing software.

New structures, yet similar practices

Many of the patterns and themes that emerged in the data from Ian's student teaching and his first full year in the School District of Philadelphia also became apparent in Ian's practices throughout his year at City High School. This indicates that the viability of Ian's practices was not dependent on a field or context; he did not need a particular classroom, curriculum, set of students to engage in specific actions. Regardless of the structures that unfolded at City High School amidst the chaotic, dynamic nature of the school, Ian was still able to enact many of the practices that were congruent with his beliefs about teaching, student learning, the curriculum, mathematics, and science content and pedagogy. Even more importantly, he had extensive opportunities to consider how these elements intermingle to inform his day-to-day practice of teaching in an inner-city school.

However, Ian did continue to grow as a teacher during his second year of service. First, he expanded on his one-on-one work with students connecting it to his classroom teaching. He realized that tutoring students individually was a great way to assess students. This information could then be used to inform his planning and instruction. Second, Ian had the opportunity to create new courses at City High School in technology and robotics. These new courses enabled him to see whether the pedagogical practices he felt most comfortable with worked in a class other than math or physics. Third, Ian took it upon himself during his second year of teaching to initiate his own research by refining his own questions, collecting data, and taking steps to disseminate his findings. Although Ian's philosophy of teaching had always included elements of inquiry and action research, during his second year he took more of a lead role.

One of the most important findings that emerged in this chapter was the interconnectedness of Ian's practices. Ian continued to do many of the same things he had done previously, however each disparate practice became increasingly connected to others. For instance, Ian's capacity to build relationships with students was influenced by his open-door policy. Since students felt comfortable coming to him with questions or to talk, he was able to build social capital, or social networks, which led to enhanced relationships. Once he built relationships with students, they were more apt to come to him for help when they had questions in his class or in any others. The social and symbolic capital that Ian had built with students, either through tutoring, the open-door policy, or in class, could be exchanged for participation in class activities. Students were more willing to try an activity and get involved with a problem or question since they cared about Ian as a person and knew that he cared about them. Finally, Ian's one-on-one work, which was enabled by many of his lab-like or project-based activities, enabled Ian to assess his students regularly. As he sat with a student and talked to him or her about a problem, he could get a better sense of their needs and could offer support accordingly. As a backdrop to each of these practices, Ian looked at his work as being strongly driven by research. Throughout the year, Ian continually collected data and made decisions based on emergent findings—many of which were heavily informed by his students' perspectives.

In the next chapter, we look longitudinally across the data sets and analyses presented within Ian's story and discuss the transferability of practices across fields. We also discuss his agency by describing the ways in which he was able to achieve his goals as a beginning inner city math and physics teacher.

8 The big picture: Looking across fields

Throughout the chapters in this book, we have described Ian's more prominent classroom practices, such as building relationships with students, using creative, science-based activities in mathematics, and working with students individually. In this final chapter, we return to the broad research questions we outlined in chapter one. Although we have discussed findings for the more narrow, field-specific questions in chapters two through seven, in this chapter we look at the findings across fields. Using the structure/agency dialectic, we review the patterns longitudinally using a macroperspective. We elaborate on themes within the bigger picture by looking across the smaller, mesolevel findings illustrated in previous chapters. Additionally, we evaluate the study using Guba and Lincoln's (1989) authenticity criteria. We conclude with implications for teacher educators and policymakers in urban districts.

A macroperspective: Revisiting our initial questions

One of the unique aspects of this study is its temporal range. Because of the size of our data collection surrounding Ian's practices, we were able to look at his practices spanning his transitions between several contexts of teaching, or fields, which are organized both temporally and spatially.

We utilized Bourdieu's concept of field as a constructive means of organizing Ian's initial teaching experiences, which varied with regard to time, locale, and coparticipants. However, by taking a macrolook at the fields adjacent to one another, and considering the porous composition of their boundaries, we now examine the structures, particularly Ian's schema and practices, that have traversed the boundaries of one field to become salient in another.

By returning to the definition of structure, the activity within and across fields can be better clarified. "Structures, then, are sets of mutually sustaining schema and resources that empower and constrain social action and that tend to be reproduced by social action" (Sewell, 1992, p. 19). Although we analyzed

three fields, it is imperative to recognize the myriad other fields that also shaped Ian's practices, yet were not discussed, such as those that made up Ian's experience as a student. In the sections that follow, we talk about the phenomena that we observed and analyzed *across* four major fields: Ian's preservice experiences, the summer curriculum project, Ian's first year of teaching at Leach Learning Academy and his second year of teaching at City High School. In an effort to describe our new understandings, we first discuss Ian's agency and teaching practices amidst the evolving, unfolding structures he encountered over the course of the study. Then, we address the specific practice of building relationships with students and how it impacted Ian's teaching across fields.

Question #1: Structures, agency, and teaching practices

In the first chapter, we asked:

> What are the structural changes that Ian encounters as he transitions through various fields, and how do these changes affect his agency? Do his teaching practices traverse fields?

Throughout Ian's development, he continually interacted with structures, which changed and unfolded in each field. We found that the structures varied immensely between the two urban schools where Ian worked, even though they were located within the same school district and served similar student populations. We also found that the structures within one of the institutions, Leach Learning Academy, changed over the period of one school year. These dynamic, unfolding structures impacted Ian's agency in different ways over his first few years of teaching. However, Ian also actively altered structures and produced new culture within each of the fields of analysis.

Ian's schema: Beliefs about teaching

Our research reiterated that the schema and resources that emerged in a given field shaped Ian's practices. Even in the first field of coteaching, Ian's practices were shaped by his beliefs about teaching and learning. His practices, or the actions that he enacted in the classroom on either a conscious or unconscious level (such as his manner of commanding the students' attention or walking around the classroom to work with students individually) may have traversed into the coteaching field from his experience as a swim coach.

Structures, according to Sewell, consist of schema and resources that mutually inform one another. These structures can navigate the porous boundaries of

fields. Thus, we must explore the origin of Ian's schema and the practices that were informed by his schema. What shaped Ian's practices in the first field for analysis—the coteaching field? At the very beginning of his teaching experience, Ian expressed his beliefs in a teaching philosophy paper that was the centerpiece of his portfolio. He also developed schema about teaching and his role as a teacher early on in his coteaching experiences with Jack. However, multiple other fields also shaped Ian's schema at that point. Two integral fields discussed briefly were Ian's experience as a student (as presented in his biographical sketch in chapter one) and his science methods class, in which he was exposed to certain methods, rules, and ideologies about teaching and learning.

For instance, Ian had developed a cultural model (Gee, 1999) of what a teacher *should not be*, which was based on his experiences as a student. He also developed schema connected to his philosophy of getting to know students. Ian had come to the teacher education program valuing the power of building relationships with students, probably because of his work as a swim coach. However, he was able to conceptualize his beliefs through his study of sociocultural theory in his science methods course. In that class, Ian began to realize the potential of using Bourdieu's (1986) forms of capital to inform his teaching. On a practical level, he applied this particular theory as he considered ways to build relationships with his students based on mutual respect. Thus, his beliefs at the beginning of coteaching were transferred from other fields, such as those he participated in as a student, his experiences as a swim coach, and his science methods course.

The schema Ian developed also shaped his work during the summer curriculum project and during his two years of teaching in Philadelphia. As Ian gained experience and moved through each field, his schema surrounding teaching and what it means to be a teacher did not necessarily change. Even toward the end of his year at City High School, Ian continually talked about the importance of building relationships with students. His beliefs about lecturing also changed only slightly; he began to incorporate more whole-class direct instruction into his algebra course at City High School only when he noticed that his entire class needed a general explanation.

Ian's beliefs about teaching math using science concepts most likely stemmed from the schema he consciously and unconsciously constructed as an engineering student. His rationale for teaching math in a science way iterates this schema: "I always thought that it made more sense to see math as a tool for science rather than a set of arbitrary rules" (Interview transcription, 3/4/04). Thus, Ian's beliefs about the field of mathematics in general were connected to his practices as a math teacher. These schema, in turn, became part of the

structure of the field. On an unconscious level, Ian may have structured his classroom in this way to expedite his agency; he would be more successful teaching "math in a science way" because of his positive past experiences teaching physics.

Ian's practices in relation to others

It is also important to situate Ian's practices in relation to those around him.

> The practices of Cristobal and Regina [coteachers in this particular study, an experienced teacher and a student teacher, respectively] also are part of the structure of the science classroom in which Regina [the student teacher] teaches and learns to teach. So, too, are the practices of the students and the material resources available for appropriation. (Tobin, Zurbano, Ford & Carambo, 2003, p. 57).

Regina, the student teacher mentioned in the quote above, experienced structures that emerged based on the individuals in the classroom, the practices of the students, the physical resources available, and the practices of her coteaching partner Cristobal. Coteachers often "become like the other," at a microscopic level (Tobin et al., 2003). Since our analysis did not touch upon the commonalities of Ian and Jack's practices at the microlevel, we did not seek substantive evidence to demonstrate that they began to embody each other's practices. However, we found that Ian developed practices that *supported* Jack's practices. Throughout their experience in the engineering physics class, Ian's practices were shaped by what Jack did in the classroom. For instance, when Jack used direct instruction at the board to teach a physics concept, Ian would walk around and work with students individually. Conversely, Jack's practices supported Ian's practices. Without Jack's presence, Ian may not have been able to successfully implement some of the practices we described in chapter two, which were integral to his teaching goals. The practices that Ian developed in the coteaching field, which were strongly shaped by Jack's practices, became the foundation for Ian's embodiment of teaching. Some of his practices became unconscious and patterned, and some were directly in line with his specific goals. Some practices straddled the unconscious/conscious divide, especially when Ian was made aware his actions in cogenerative dialogues or in his reflective debriefing sessions with Jack.

Ian's practices across fields

Many of the practices that Ian used regularly in fields two (the summer curriculum project), three (Leach Learning Academy), and four (City High School) were initially developed in field one (coteaching). For instance, Ian's role as one who circulates to speak to students individually or in small groups was fostered

by Jack's tendency to take the lead role as a lecturer and Ian's interest in getting to know the students. In field two, the nature of the curriculum project fostered Ian's practices, in that it involved frequent discussion, reflection with students, and cogenerative dialogues. In other words, he had many opportunities during the summer curriculum project to develop his practice of getting to know students, which shaped and was shaped by his belief that respecting and getting to know students was a valuable endeavor.

By the time Ian entered field three (Leach Learning Academy), building student relationships had become more conscious and habitual. Ian was accustomed to a classroom structured to encourage his practices. By field four, Ian realized that additional benefits emerged from this practice; he could offer individualized, differentiated instruction that was respondent to students' specific needs. In each of these fields, Ian's agency, or his power to access resources, was related to the structure of the environment. He was able to find resources to meet his goals, thus consciously or unconsciously structuring the field in a specific way. In this, Ian resisted being merely a product of his surroundings; he accessed resources to further his goals in each of the fields. In essence, it is impossible to look at the relationship between Ian's practices as structures without also exploring his agency.

By looking at the data longitudinally over fields, the characteristic of agency as transposable becomes apparent.

> [T]his seems to me inherent in a definition of agency as the capacity to transpose and extend schema to new contexts. Agency, to put it differently, is the actors' capacity to reinterpret and mobilize an array of resources in terms of cultural schema other than those that initially constituted the array. (Sewell, 1992, p. 19)

As Ian moved from one field to another, his agency was evident even though he had access to different types of resources. For instance, although Ian was teaching mathematics at Leach Learning Academy, he was able to reinterpret and mobilize the teaching resources and activities he had utilized while teaching engineering physics at City High School. Some of the structures at Leach Learning Academy may have resonated with those he had come to know at City High School, which may have fostered his agency further. Nevertheless, it was the unfolding structures in each field that enabled Ian to carry out successful practices as a beginning urban teacher, such as building relationships with students and reframing the traditional mathematics class.

Restructuring the classroom to produce new culture

Another instance of Ian's agency that emerged in the analysis was his ability to consciously restructure the math classroom in an atypical way, which subsequently led to the agency of the collective. First, Ian's agency was evidenced in his creativity and his use of activities (resources) that he had previously created in the engineering physics course. Second, because Ian had built social and symbolic capital with the students, they were accepting of Ian's ideas and usually participated in the activities. In participating in these hands-on activities, the students were actively reproducing the class culture. However, the class was structured much differently than math classes they had experienced in the past, which were often removed from real-life, actual situations. As he presented math in an innovative way, the students were more apt to get involved in the class and were easily able to contextualize the math concepts in more intuitive ways.

Fortuitously, Ian's use of physics activities and resources in the mathematics classroom was successful. As a result of the "unpredictability of resource accumulation," "the enactment of cultural schema is never entirely predictable." For instance, a joke that was successful with one audience may fail horribly with a different audience. "The effect of these actions on the resources of the actors is never quite certain" (Sewell, 1992, p. 18). Thus, it was possible that some of Ian's practices would be unsuccessful as they were enacted in other fields. For instance, some of the hands-on activities that had been successful in the engineering physics class may have been unsuccessful in the Core Plus Math class, regardless of the compatibility between the concepts and the activities he had created. However, many of these practices were successful, possibly because of the similarities of the actors (the students) in each of the fields. Many of the students had grown to dislike mathematics or felt unsuccessful with other teachers' traditional teaching methods. However, Sewell's notion emphasizes that Ian's use of such practices in a field with highly different resources might have produced different results.

In conclusion, we claim that Ian's practices traversed the spatially and temporally bounded fields dictated by his teaching experiences. Many of his practices emerged during coteaching in his work with Jack. The analyses from each field show that Ian's practices changed very little over two and a half years. For the most part, the structures that Ian encountered within subsequent fields supported his practices. When they did not support his practices, Ian was able to access and appropriate resources in order to actively restructure the field, so that he could act in ways that would enable him to meet his goals.

Question #2: Building relationships

The second set of overarching questions we posed was more specific to Ian's goals as a teacher in an urban high school. We asked:

How did Ian build relationships with students across cultural, racial, gender, and socio-economic boundaries? How did these relationships affect teaching and learning in his classroom?

Questioning the culture of power in classrooms

In chapter one we elaborated on the Eurocentric model that drives most schools in the United States, which is presumed to be applicable to all students regardless of cultural background. We also described the culture of power enacted in classrooms, which is governed by codes and rules that are reflective of a White, mainstream ethos. However, we contend that Ian worked to affirm his students' identities by recognizing their cultural capital and through his efforts to build social capital with them.

Ian's attempts to build a classroom community based on respect and trust show that his goals sought to disrupt the culture of power. By building trusting relationships with students and by asking them to share their perspectives in cogenerative dialogues and other forums, Ian actively sought to change the students' conception of the teacher as one who holds the power to one who recognizes the responsibility of all participants in the classroom community. For many students at Leach Learning Academy and City High School, Ian's interactions with them were much different than they had encountered with other teachers. At times, Ian was shocked by their reactions to a caring question. In addition, Ian's science and math classrooms differed greatly from the traditional classes he had experienced as a student. Ian recognized a "disidentification," or emotional detachment from school in many of his African American students, however, he refused to lower his expectations. He also refused to focus extensively on controlling student behavior. Although some of Ian's students thought he was a pushover at times, his classroom management plan focused on building relationships with students that would encourage buy-in and engagement, rather than focusing on discipline.

Exchanging capital for buy-in

Ian's successful efforts to build relationships with students were evidenced repeatedly in the data analysis chapters. In chapter one, we framed one of the issues in the study as the historic neglect of African American students, which is

compounded by theories of deficit that impact their learning and experiences in schools. However, Ian's efforts to build social capital with his students, the majority of whom identified as African American, was an example of his agency and ultimately led to his success. Ian was able to build social capital with students by listening to them, helping them during class time, offering extensive tutoring sessions, allowing them to "hang out" in his class rather than going to the lunchroom, being friendly, joking around, offering a laid-back, casual atmosphere and creatively tailoring his lessons for the students' engagement. The social capital he built could be used as exchange value—he could use it to get students to assent to learn or to "have his back." For the students Ian taught, to "have someone's back" implies that one has a commitment to another's well-being and safety. Once students had Ian's back, they were more apt to participate in the learning activities that Ian had planned, even if they disliked the class or the subject matter.

Even though Ian's practice of building rapport with students may seem intuitive and connected to his personality, the structures in each of the fields helped to facilitate it. For instance, the fact that there were two coteachers in the engineering physics class made it possible for Ian and Jack to split the class into two at times. While working with a smaller group of students, Ian could spend additional time talking to students. Also, during the first few weeks of school at Leach Learning Academy, Ian made the decision to interview students individually to find out about them on a more personal level. Because of the activities he had structured into class time, which involved collaborative group projects, he was able to take students out into the hallway for interviews without disrupting the classroom routine or taking away from instructional time. Both of these choices were supported by the class structure. Conversely, Ian's choice to interview students and to divide the students into halves impacted the class structure. As Ian built social capital with his students in each field, his symbolic capital, or status as a caring teacher who was interested in students' lives, also grew.

Valuing student perspective

Ian's use of cogenerative dialogues enabled him to accrue both social and symbolic capital in each of the fields of analysis while incorporating student voice into the classroom decisions. In each cogenerative dialogue, he had opportunities to speak with students on a different level about aspects of the class, his teaching, and their learning. Since they were generally casual, laid-back meetings that included food and drink, the few minutes before and after the discussion began was a time for Ian to talk to students about other areas of their lives or to joke around with them.

The cogenerative dialogues became more important to students when they realized that all participants' voices were considered equal. In addition, their perspectives and participation in the community were validated when they saw their ideas for change come to fruition in the classroom. Their confidence was enhanced by Ian's interest in their ideas and willingness to change the structure of the classroom according to the understandings and responsibilities generated in the dialogue. Ian also showed the value of student perspective and a democratic classroom through the use of surveys and through other informal means of soliciting student feedback.

Many of the students cited in the study mentioned that Ian's commitment to getting to know students and valuing their perspectives was atypical. This is something that mystified us throughout the data analysis; we were surprised that students did not mention other teachers with similar attitudes and practices. Thus, Ian's story shows evidence that building bridges between the borders that normally function to divide students and teachers may happen infrequently in schools, at least for the students in our study. We believe, however, that Ian's story shows that such relationships are an important first step in constructing a caring classroom community. Even as a beginning teacher, Ian was able to cultivate such a community and get his students involved in learning science and mathematics.

The interconnectedness of Ian's practices

As we analyzed the data from Ian's second year in the classroom, we became aware of the interdependence of Ian's practices: we realized that each pattern within Ian's classroom routine was connected to other patterns. Collectively, these schema and practices became part of the structure, which was dialectically related to his agency. We found five general themes that emerged over the course of the study: teacher research, cogenerative dialogue, an open-door policy, one-on-one tutoring, and building relationships. However, it is impossible to separate any of these practices from one another. Together, in addition to many other tangible and intangible elements, they form the structure of Ian's classroom, which directly impacted and was impacted by his agency.

Ian's interest in teacher research was an important aspect in itself; however, this inquiry also informed his planning, teaching, assessment, and the ways in which he consciously and unconsciously interacted with his students. Cogenerative dialogue was a medium for Ian to carry out his teacher research. During the dialogues he could "collect data" about his classroom while showing the students that he valued their perspectives. Ian's open-door policy made students

feel comfortable participating in cogenerative dialogues or coming in for out-of-class tutoring. They also came to Ian to talk about other things. Whether it was about spontaneous combustion, religion, or the results of one of the National Basketball Association games the night before, Ian interacted with students in a way that built social capital and showed students he valued their lives outside of the physics or mathematics classroom.

Because of his self-reflection and use of action research, Ian was able to discern that working with students one on one in the classroom was a strategy that was culturally responsive and driven by students' needs. Although he developed the practice as a result of his interest in working with students individually to build relationships and because of his discomfort with lecturing, he had opportunities to assess the effectiveness of this practice throughout his first two years in the classroom. Since the students were accustomed to getting individualized attention from Ian in class, they felt that they could come to Ian for tutoring, even for other classes. His open-door policy also encouraged students to come to him for extra help.

Finally, Ian's interest in building relationships influenced all aspects of his classroom. His sense of caring about students sustained these relationships and his desire to teach for social justice. Ian's relationships with students also spawned his continuous use of cogenerative dialogue beyond his experiences in coteaching with Jack. Ian's open-door policy and extensive tutoring are also tied to his dedication to his students. This was clearly evidenced by his willingness to help students gain access to resources by tutoring them in other classes and even by helping them get into the computer lab. Ian's sense of caring for his students was the basis for all of his actions in the classroom; yet accordingly, Ian's practices reified his ethic of care.

Each of these elements was discussed in-depth throughout the previous chapters. Because of the connections between each of Ian's practices, we believe that collectively they demonstrate Ian's agency. The connections among Ian's practices have important implications for other beginning teachers who hope to implement Ian's ideas and methods in their own classrooms.

Evaluating our work

In this section we utilize Guba and Lincoln's (1989) authenticity criteria as means to evaluate our research. The five criteria developed by Guba and Lincoln are appropriate in evaluating our study in particular because of their emphasis on the validity of voice for all participants *while* the study is designed and carried out. The criteria, which are fairness, ontological authenticity, catalytic authenticity,

and tactical authenticity, will be addressed individually in this section in an an effort reflect on our work and offer a summative self-evaluation.

The fairness criterion assesses the extent to which the participants' own constructions of phenomena are sought and respected throughout the study. In the research design, we fully anticipated that the voices of Ian and the students involved to be articulated accurately and impartially. Additionally, we had hoped that the students would be involved in the data analysis stage—we believed that the cultural capital of each individual was valuable and would enhance the study. Thus, throughout the data collection, analysis, and writing phases, we tried to involve students in various ways. For instance, during Ian's year at Leach Learning Academy, we hired two student researchers to help collect and analyze data for the project. Over a period of about two months, Ann and Tanazia (the student researchers) helped review videotape of their class to look for patterns of thin coherence, as well as contradictions. Through cogenerative dialogues, other students took an active role in the data analysis process—as we began to see patterns emerging, we discussed them in cogenerative dialogues to get an emic perspective. Additionally, whenever Beth took the lead on writing a chapter, Ian critically read a draft version and challenged any of the constructions with which he disagreed. Throughout the analysis, we negotiated our understandings as collaborators and coauthors. We also invited students to join our conversations whenever possible with the hopes that the project would be based on our collective endeavors.

Ontological authenticity considers the degree to which participants' emic constructions are developed, enhanced or expanded. This criterion was met for the students and for us as both authors and participants. Ian's participation in the data collection, analysis, and writing was a meaningful example of ontological authenticity because of the understandings he benefited from throughout the process. In each cogenerative dialogue and after repeatedly viewing video of himself, Ian came to new, expanded constructions about his role as a teacher. As he learned more about himself and his classroom, he grew more interested in research and began to think about new questions. Beth also grew throughout the process. She continually questioned her own epistemological beliefs and pedagogical practices as she talked to Ian and worked with the students. Finally, through our discussions and cogenerative dialogues, the student researchers began to identify ways they could structure their learning experiences to increase their own agency. Both Ann and Tanazia left the experience with new understanding about their roles as learners and how they could access resources to meet their needs in their academic courses.

The educative criterion, which evaluates the participants' understanding and appreciation for others' constructions of phenomena, also became salient in our cogenerative dialogues. Through the students' rich description of other teachers, we began to reframe our notions of effective teaching. Rather than categorizing the other teachers as either good or bad, we used Sewell's theoretical framework to recognize how teachers structured their classrooms to foster or truncate agency for the collective endeavors of the class. The educative criterion was also validated when both of us recognized the extent to which the students in Ian's class had reconsidered their own constructions of the teacher's role. They also began to consider Ian as a resource for their own learning, as well as an individual who they could trust with issues outside of the realm of classroom activity.

Inherent in any critical ethnography is catalytic and tactical authenticity. Catalytic authenticity assesses the extent to which action is motivated, while tactical authenticity evaluates the extent to which participants are empowered to act. "For a study that is concerned with social transformation and student agency, a research process that encourages action and change or catalytic authenticity is extremely important" (Elmesky, 2001, p. 75). The students' receptiveness to cogenerative dialogue and their willingness to help restructure the classroom environment demonstrated how this research fostered their own agency. A clear indicator of the catalytic and tactical nature of this study was the students' desire to spread some of the practices they had encountered in Ian's classroom, for instance, the cogenerative dialogue, to other teachers and other classes. One student even wanted to have a cogenerative dialogue with the principal regarding issues that needed to be discussed throughout the school. In addition, the extent to which readers will feel compelled to reconsider their practices in light of the discussion surrounding Ian's story is also a means of assessing the catalytic and tactical criteria. To that end, we discuss implications and suggestions that serve as an impetus for further reflection, reform and action.

Implications from our work

For school district policy

With the recent state takeover and the restructuring of leadership in the School District of Philadelphia, several positive steps toward change have recently occurred to attract new teachers and sustain their employment. For instance, the *Teach In Philly* web site gives prospective teachers a clear and explicit home base that includes the steps and required forms one would need to apply to the

district. It also offers information on relocating to the city as well as a listing of colleges and universities in the region where individuals can pursue teaching certification or advanced degrees in education.

However, problems abound once individuals have submitted their paperwork to the district headquarters and are awaiting placement. In Ian's case, he was unsure as to whether he would have a position in the district, and if so, in which of the district's schools it would be. Less patient individuals may have given up and chosen to seek employment in a smaller, more organized district. Also, when Ian contacted human resources to find out about timelines or to inquire about the paperwork items he still needed to complete, he often received misinformation from the staff. Thus, a stringent evaluation of the hiring practices and the organization of the human resources department within the district is warranted given the trials and tribulations associated with Ian's experience. Chapter four revealed that Ian's hiring experience was not atypical since other veteran teachers also complained about the disorganization of the district's hiring processes.

Another positive initiative for the 2003–2004 school year was a change to the new teacher induction program. New teacher mentors or coaches were assigned to all new teachers in the district. The new teacher coach would lead a cluster of new teachers in a regular seminar to discuss prevalent issues and also visit the new teachers' classrooms for observations. Even though this was theoretically a good idea, Ian often complained of having to travel to other schools for the mandated seminar, since the new teachers involved in his math and science group were from various schools. Ian also complained that some of the topics covered at the regular seminars were irrelevant. Thus, an examination of the professional development topics to be covered with new teachers would be timely. If job coaches were appointed at each school location, new teachers would not have to travel and would have increased access to mentors in times of need. Also, mentors should solicit regular feedback from the new teachers and continually assess the relevance of the topics they are covering.

If the district is to combat their bleak teacher turnover problems, policymakers need to consider the structures in place at several levels. The district at large must reconsider the individual experiences of prospective teachers throughout the hiring process and as they navigate the nuances of the system. In addition, individual schools must help to ease the transition into the first year by being proactive and supportive with new teachers. In essence, new teachers need to be treated with kindness and professionalism, regardless of the district's size.

For teacher education programs

This study suggests several implications for teacher education programs. First, the coteaching model cultivated a site for collaborative teacher research for Ian and other coparticipants. Because the coparticipants had shared experiences that they could reflect on together, they could easily consider issues surrounding instruction and learning in the classroom. Ian, Jack, Mister Springer (the cooperating teacher), and the other participants in the classroom were able to learn about teaching and learning in urban classrooms together *while* enacting the lesson. This model clearly opens doors for more reflection than a traditional model in which student teachers are generally isolated from participants other than their cooperating teachers. According to the National Council for Accreditation of Teacher Education standards, programs at a superior level require that "candidates work collaboratively with other candidates and clinical faculty to critique and reflect on each others' practice and their effects on student learning with the goal of improving practice" (NCATE, 2002). In essence, the coteaching model would support a major goal of preservice teacher education as it encourages reflective practice for student teachers in collaboration with other participants in the school community. Cogenerative dialogues, used to critically reflect on the roles and responsibilities of all coparticipants in the student teaching experience, would also enhance preservice teachers' learning in meaningful ways.

This study also suggests that the coteaching model offers a buffered transition into the teacher role; coteachers can lean on one another for support and use each other as resources. This can support new teachers as they develop a sense of classroom management and as they learn to plan effectively. It also enables new teachers to think about the unconscious aspects of teaching. The added time for reflection that can unfold as a result of coteaching leads individuals to explore the connections between the education theory learned in coursework and authentic teaching practices experienced in the field.

This study also suggests that coteaching did not hinder Ian's ability to successfully teach in an autonomous classroom as one might hypothesize. In contrast, coteaching allowed him to access resources to be a more reflective, creative, and caring teacher during his student teaching—practices which followed him into his first year at Leach Learning Academy. Accordingly, a viable suggestion would be that teacher education programs consider the coteaching model during the student teaching experience or as part of other field-based experiences.

Unfortunately, negative discourse around the state of education in the United States is all too prevalent, especially in urban schools. However, the

analysis we reported on show that there is an overwhelming amount of good in urban schools, particularly in the work of new teachers like Ian who strive to implement fresh ideas in their classrooms. However, if future teachers are to be well prepared for work in urban districts, teacher education programs must become more in tune with the specialized needs of urban schools. If new teachers understand that their job is not only to teach velocity or the law of cosines, but also to be mentors to students by attempting to understand their lives in non-patronizing and nonstereotypical ways, they might find increasing success in urban classrooms. Additionally, teachers must work to transform students' negative conceptions of school, which starts by working to build bridges with students based on mutual respect. Finally, and perhaps most importantly, teacher educators need to continue to grapple with ways to foster creativity, innovation, and caring in teaching candidates.

Reflecting longitudinally: Ian's final thoughts

Fortunately, this is only the beginning of Ian's story. We have illustrated a period of Ian's work as an urban physics and mathematics teacher, yet the end of his story marks another beginning. Our work has sparked further questions for inquiry and new opportunities for us to learn more about teaching science and mathematics in urban schools. Even though the conclusion of Ian's story signifies a beginning, we conclude with Ian's reflections on first few years as an educator.

Over the past three years I have definitely grown as a teacher. When I started my Master's degree and the teacher education program, I could not begin to imagine how I would feel or what I would be doing now. I came into teaching with no grand plan or idealistic vision and I am glad that I didn't. I merely wanted to be a teacher and had some ideas about how it should be done. Teaching in an urban school was a conscious decision, but not because I thought I was going to solve a bunch of problems, but because there's plenty of people that want to go and work in the suburbs while the city needs more teachers.

I found teaching is not something you can learn to do without doing it. But then again, experience does not necessarily make you a great teacher. I would never suggest that I am a great teacher and I continually struggle with what the definition of a great teacher is. Each day I am reminded of the continuous self-reflection and feedback from others I need to improve my teaching. I also realize that it is never possible for me to be totally prepared for every challenge that arises.

During my first year of teaching on my own at Leach Learning Academy, I could have easily turned into one of those statistics about urban teachers. I knew then, like I knew

starting initially at City High School, that I had nothing to lose if I tried and that there wasn't one answer I should be looking for. I had learned a lot during student teaching from my professors, my mentor, my cooperating teachers, and my co-teachers. All of that knowledge gave me the confidence that I would not fail. Then when I changed schools and returned to City High School I knew that it had changed and that some of the things that I had done at Leach Learning Academy might not work well there. But again I knew that I had to learn and adapt to this new situation, without assumptions of what I should do. I was determined to build quality relationships with the students at City High School in the same way that I did at Leach Learning Academy. I found that despite the change of location, I could do that.

Now as I look back I see how the story is cyclical and the process is not linear. The students and I grew together and were constantly renegotiating the schema and resources that made up the structure of our class. I have learned that my students were no different than students anywhere else in the country in personality and intelligence; they are just unfortunately part of a disorganized and under-funded system. My students never judged me because I was not from their neighborhood or because of the color of my skin. In fact it was quite the opposite as most sought me out as someone to talk to.

Being a teacher researcher put me a position that unfortunately few teachers have experienced. Research of this type is more than just observations and conclusions; *it is the whole process that yields results*. Beth was involved with my class on a very direct level fairly often and helped me understand how the structure of my class was unfolding. We discussed my teaching at all levels—from how well an activity went to how certain structures in the classroom were defined. As I changed and grew, the scope of the research evolved. Overall, having the opportunity to work on this book and research my own teaching has allowed me to evaluate and improve in ways I couldn't have imagined otherwise. (Ian, written reflection, 7/5/05)

Epilogue: A metalogue on new understandings

Ian: I first want to mention that I am lucky to have been involved with this study. Unfortunately, as a teacher it is rare to get the opportunity to do work of this nature. This study has penetrated my teaching at all fronts, from assessment techniques to my incorporation of student voice. When we began I could not see what my role in all this was. It was strange to talk to someone about your teaching and work with him or her to understand why some of what you do is effective while other things are not. But those initial feelings quickly turned to appreciation and commitment. I appreciated your commitment to my students' opinions and my own opinions. I appreciated talking to another teacher about effective practices and educational theory. And I became committed to the research in my own way. I realized the importance of trying new things in my class and evaluating the process. I also realized that as a teacher, I could not simply do my job in isolation; I must incorporate my students and peers to improve my own teaching.

Beth: It is good to hear that the research aspect of this book has had a huge impact on your teaching. For me, it is interesting to think about the understandings you gained as a result of this project on a few different levels. By being introspective in the classroom, you learned about your students. Cogenerative dialogue was particularly useful for this. You also became more introspective about your teaching, and watching the video data was a way to think about your unconscious practices and how they agreed with what you consciously wanted to do and thought you were doing. Then, as you worked on the book, you got another sense of your classroom practices and their place among the macrolevel structures you encounter in urban schools.

Ian: I agree that my practices were affected directly by the research for this book and also by writing this book. Watching myself on tape and watching cogenerative dialogues over again allowed me to understand my own practices and how they affected the students in the class. I feel that this process made me more conscientious of how each of my actions was

interpreted and how that shaped the students' opinion of me and my class. From my time as a student teacher until now I have made a determined effort to reach out to the students and understand their perspectives and feel this research allowed me to see the results of this effort directly.

Beth: Our work together has also impacted my teaching and the ways I think about teaching and research. Over the last two years, I've had multiple opportunities to question my beliefs about teaching and my conscious practices, such as how I plan and the amount of control I want to have over my students. This was especially relevant in our discussions about classroom management. As a beginning teacher, I think I focused on controlling students too much; I thought that control was a prerequisite for learning to occur. I think that this research has encouraged me to totally rethink this. As a teacher educator, I've begun to encourage my students to think about classroom management in different ways and to resist this stance. I've also had a lot of time to think about relationship building in teaching. Over the past year, I've reflected on how my relationships with students impact their experiences as learners in my course, and I think that the some initial legwork in the beginning of the semester is necessary for relationships to grow. However, I also think that this work has sparked new research questions for me as teacher researcher. I want to know how I can get my students (future teachers) inspired to work in urban schools and beyond that, how they can work with diverse students in meaningful ways. Moreover, I don't want them to think that they'll be heroes swooping down to save all the poor, urban kids. I think this encourages a deficit view. Our work has really made me think about these issues more.

Ian: To address the first point you made about classroom management I agree with you that too often beginning teachers fall into the trap of concentrating only on control. Having sat through countless hours of teacher training and development I found that experienced teachers were quick to scare me and other new teachers into focusing only on behavior issues. A lot of people talk about setting precedence at the beginning of the year, but sometimes this can take the focus away from learning from day one. I would never suggest that my classroom was 100 percent efficient but I would claim that students enjoyed coming to my class and that my relationships with students supported this. I agree that seeing oneself as a hero in urban schools can lead to a deficit view of the students. It is not fair to suggest that because I am from a more privileged background that I am making a sacrifice to work with urban students. Teaching is a job and a profession and taking the stance of an outsider is detrimental. Thinking of myself as a hero implies a distance from the students and their lives. I agree with Freire; to really make a difference one must be in with the people.

Beth: So how were you "in with the people"? I felt like I learned a lot about the students' cultural capital throughout the project, such as what they brought to the classroom. This was especially the case during our summer curriculum project, as we got to know the student researchers by working side by side with them. But as a teacher, with those traditional power differentials (you are the teacher, the center of attention, the one in control), how were you actually in with them?

Ian: I believe that I was in with the students at school. I never took the total leap and got involved with the students' lives at home or with their parents lives, although maybe I should have. I feel like I was one of the few people in many of the students' lives that they trusted enough to talk to. This happened at both Leach Learning Academy and City High School. I had many students come to me to discuss issues having nothing to do with school. Oftentimes they came to me because they needed someone else's opinion and they knew I would be there to listen to them without being judgmental. I felt that getting to know the students on a personal level reduced some of the issues that most teachers claim to have with students. I didn't have too many horror stories as a result. For instance, students would rarely disrespect me in front of the class or privately. Because of our relationships, I was able to break down a lot of the barriers typically faced by students and teachers. Also, I think one of my biggest assets as a teacher has been the fact that I am confident and willing to fail. For new teachers who are interested in working in urban settings, I hope they understand who they are. I've found that one cliché that holds true is that students can see a fake smile away. If teachers try to act like someone they are not, the students will know immediately. However, I've learned a lot of this through my research, in cogenerative dialogues and by "interviewing" students one-on-one. So much of my work can be seen as research.

Beth: I think I'll try to infuse the idea of teacher as researcher into my preservice teachers' work from the beginning. That was a unique aspect of your teacher education program; I think you were almost trained to think like that from the beginning. However, many new teachers are fearful of the idea of being a "researcher", it has a very serious connotation. Yet encouraging new teachers to think in inquiry-driven ways is different and may seem a bit less scary. I guess it's analogous to the work you did with your students, you had to convince them not to fear math and to be willing to think through problems. However, you also learned that you had to differentiate based on students' needs and where they were skill-wise at that point. Perhaps I have to do that as well. Some of my teacher candidates may be willing to jump in, as you were, and begin with some serious classroom research. Others may need more support or may just be better served in thinking like a researcher.

Moving ahead: Reflecting back and looking forward

Ian: From here I think we keep going. If there is one thing I have learned by doing this research is that I should always be researching. As a teacher I need to continue to research my own practices and improve my teaching, I cannot let myself fail into a trap of repetition and complacency. I agree that it is imperative to make research part of every teacher's training. Teachers need to expose themselves to new thoughts about education and open themselves up to new experiences. I've found that the traditional professional development model is not well received by teachers. They dislike it and it does not directly connect with their specific needs, concerns, and issues. Every profession requires continuous learning but somehow teaching has lost that aspect because of the traditional professional development that is used. In the end, though, what do we really expect from teachers? Is it possible for every teacher to work with a university researcher like you? Would they even buy into it? And would this research have been possible without a teacher like myself with some basic training?

Beth: Well, I would argue that one learns how to teach by doing it. For me, research is just the same; you learn it by doing it. I don't think your case was any different. I only learned to do research by getting out in the field. Although the qualitative research course I took was somewhat helpful, I had to make sense of the process as I was doing it. I also had to figure out what I believed about the nature of research prior to trying to make sense of the phenomena I observed. So, I believe that there are a lot of parallels between becoming a teacher and becoming a researcher. If you think about it, you were only tangentially involved in the research during coteaching. You took part in cogenerative dialogues, but they helped with your other goal of building relationships. Then, as time went on, you began to become more of a central participant (to use Lave and Wenger's framework) in the actual research. Our collaboration and ability to work together probably facilitated your comfort level in doing some of the data collection and coding (Wassell & Stith, 2005). But I still think that research has to be demystified for teachers, and that a "thinking like a researcher" stance is an integral next step—perhaps a subsequent step beyond reflection. I suppose that is what I would ultimately like to see in teachers, this disposition of inquiry about one's practice. But that certainly involves a paradigm shift.

Ian: As I move forward with my research and teaching, I think one of the biggest questions I have is to understand why some students have such a negative attitude towards school in general. Most of the students I have had have come up through very poor schools, so this might be one reason, but I think there is still more for us to understand. Also, there were some students that I could never fully reach. I taught one in particular the whole

year and at the end we still had a strenuous and impersonal relationship. Situations like that, something I can't quite put my finger on, yet they loom over my teaching. In addition, I want to explore more fully the math in a science way idea. I know there must be more people out there trying to do it as well and I feel this is a very important idea to document and expand on. What do you think your next research questions will be? Where will you carry out the research?

Beth: I am interested in how we train new teachers for urban settings. Specifically, I'd like to explore how we promote critical consciousness in beginning teachers and encourage them to move beyond deficit views of urban students. In my work in a suburban teacher education program, I notice that the preservice teachers often see urban teaching as much different than their schooling in suburban schools because of the clientele (the students). They have a "normative reference group" (Rist, 2000), which is generally based on their own experiences and schools. This comparison breeds a deficit frame—the suburban kids come to school with X, Y, and Z, while the kids in Philadelphia or Camden only have X or are lacking Y. I think our work has been an impetus for this interest. Perhaps it might be good to have teachers like you mentor preservice teachers.

Ian: I have noticed the same deficit views even in some of the teachers I currently work with and within my cohort in my teacher education program even though it was geared toward preparing urban teachers. I agree that major work needs to be done with regard to opinions of urban education and it needs to begin in teacher education programs. I think the model I went through was good, but there is a great potential for growth. From the beginning, the emphasis should be put on the relationships between students and teachers. It is not enough to simply understand learning theory, pedagogy, and classroom management; preservice teachers need to be out there teaching right away, maybe not in a formal setting but at least experiencing teaching first hand. In conjunction with early teaching experiences, preservice teachers can also start thinking about their own classroom-based research. Teacher educators can encourage them to actually try out best practices and research-based methods and then evaluate the results as opposed to simply reading about them. What it comes down to in the field it is not how many Venn diagrams you use but how you learn to be effective in your own way. This method should be used across the board but especially in the urban setting where pressure can mount instantaneously and the support network is not always in place. We need to foster teachers' thinking about ways to reach all students. I will continue to think about this, and hopefully I will evolve as both a teacher and a researcher.

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