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BECOMING-TEACHER: THE NEGOTIATION OF TEACHING PRACTICE OF FIRST-YEAR SECONDARY SCIENCE TEACHERS PREPARED IN A HYBRID URBAN TEACHER EDUCATION PROGRAM

A DISSERTATION

Submitted to the Faculty of

Montclair State University in partial fulfillment

of the requirements

for the degree of Doctor of Education

by

KATHRYN JILL STROM

Montclair State University

Upper Montclair, NJ

2014

Dissertation Chair: Ana María Villegas

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MONTCLAIR STATE UNIVERSITY

THE GRADUATE SCHOOL

DISSERTATION APPROVAL

We hereby approve the Dissertation

BECOMING-TEACHER: THE NEGOTIATION OF TEACHING PRACTICE OF FIRST-YEAR SECONDARY SCIENCE TEACHERS PREPARED IN A HYBRID URBAN TEACHER EDUCATION PROGRAM

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ABSTRACT

BECOMING-TEACHER: THE NEGOTIATION OF TEACHING PRACTICE OF FIRST-YEAR SECONDARY SCIENCE TEACHERS PREPARED IN A HYBRID URBAN TEACHER EDUCATION PROGRAM

by Kathryn Jill Strom

While research suggests that new teachers work to put into practice the pedagogy learned from their preservice preparation programs during their first year of teaching, they often resort to traditional, teacher-centered pedagogies even when prepared to use innovative practices, particularly in urban schools. Relatively little is known, however, about *how* this process of perpetuating traditional teaching occurs. Using a theoretical framework informed by equity-minded pedagogy and rhizomatics, this study investigates the question, "Given their common experiences of preservice preparation in a hybrid urban teacher education program, how do three first-year teachers negotiate their pre-professional learning within their new environments as they construct their practice?" To examine teaching as complex phenomena, I used methods underscored by postmodern perspectives, blending rhizomatic mapping and situational analysis to construct three case studies.

I found that despite engaging in different micro-level interactions within their respective classrooms and schools, the three teachers featured in this study built their teaching practices through multiple similar, recursive, connected, and contextually situated processes. These included modifying their preservice learning to fit their new school settings and students, negotiating with students for their participation in learning

activities, and constructing and enacting teacher-selves. Elements within the teacher herself (e.g., her beliefs and background experiences); the classroom (e.g., students and physical space); the school (e.g., school leadership and particular school norms); and the larger district/state/national contexts (e.g., mandated curriculum and standardized tests) shaped these processes and ultimately, each teacher's practices. These findings suggest that the relationship between pre-professional learning and classroom teaching is complex and non-linear, especially as the teacher's preservice learning is only one of many factors influencing her instructional practices. Moreover, the work of teaching is fundamentally relational, meaning that the objects, ideas, people, and spaces with which the teacher connects irrevocably influence her teaching practice. Finally, because enacting equitable teaching practices in urban schools challenges dominant norms and the structures that reinforce them, the process cannot be expected to occur smoothly. However, teachers might pursue lines of flight, or breaks from the status quo, and over time these can contribute to larger changes.

DEDICATION

This dissertation is dedicated to my wonderful husband, Michael Strom; my always-supportive parents, Ron and Jeanne Sellers; and my amazing mentor, Ana Maria Villegas. None of this work would have been possible without you.

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When I first faced the task of designing, implementing, and writing a dissertation study, I was petrified with fear at the thought of taking on such a momentous task on my own. In truth, I was never alone—I had an amazing community and family that supported me academically, emotionally, and socially through the last year and a half. You all have your mark on this work in some way.

My first thanks go to my committee: Ana Maria Villegas, Monica Taylor, and Kathryn Herr, who have truly, in Monica's words, "Been on the journey with me."

In the April 2013 awards ceremony, a woman sitting next to us asked Ana Maria if I was her daughter. Smiling warmly, Ana Maria said to me, "You could have been." Ana Maria, you have been an amazing teacher, mentor, and advocate, a surrogate academic parent providing invaluable advice and guidance, giving selflessly to see me succeed and never faltering in your belief in me. Words will never be able to adequately express my immense gratitude to all you have done for me during my time at Montclair.

Monica, you have taught me so much. You introduced me to self-study, feminism, and the true concept of praxis. You have shared in my learning and excitement about rhizomatics and poststructural research and you have helped shape my beliefs about what it means to be a caring teacher/teacher educator. I am so thankful for your support and mentorship.

Kathryn, thank you for providing valuable methodological guidance and being the first to encourage me to "play" and "experiment" with my data. When I was at my most frustrated, you told me, "You'll know when you get there," and I'm convinced that wiser words were never spoken (at least in relation to data analysis).

I also would like to thank my husband, Michael Strom, for his love, support, and understanding during the last few years, but most especially during the extreme ups and downs of writing this dissertation. Mike, you are a true life-partner. I love you so much for always standing beside me and encouraging me to pursue my dreams.

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PREFACE

> I'm walking away. I'm walking away from all the time I spent in school, all the files and supplies I have, many sweet students, health insurance, all of it. Teaching is just not worth the constant stress that crushed my very soul and being. (Scherff, 2008, p. 1327)

The sentiments above come from a dual case study of two first-year teachers who left the profession after their initial year of teaching. The name of the study, "Disavowed," could be applied to the many stories of first-year teachers who make the difficult decision to leave the profession every year because they often find themselves with the most difficult class assignments, isolated, without proper supports, and with administrators and colleagues who value traditional teaching practices which clash with the more equitable approaches to teaching learned in their preservice programs. These conditions are more likely to be prevalent in urban schools serving populations of low-income children of color (Achinstein, Ogawa, & Speiglman, 2005), where newly graduated teachers are most likely to receive jobs (Darling-Hammond, 2010). The difficulties of the transition from the university to the classroom and the enormous attrition rates of beginning teachers contribute to a characterization of our noble vocation as "the profession that eats its young" (Halford, 1998, p. 33).

My own experience as a first-year teacher echoes the stories of many novice urban teachers and points to the complexities of becoming a teacher and enacting socially just pedagogies. I began teaching in a large urban city in Southern California in 2005 while I was completing a fifth-year teacher preparation program. Because of the general

shortage of teachers, I was allowed to teach on an emergency certificate while completing my required coursework for a regular teaching license. In the school where I worked, the entire student population qualified for free and reduced lunch—a proxy for poverty—and my students were nearly all children of color, with high proportions of English language learners (ELLs) and special needs students. The size of my classes ranged from 38 to 42 students, with some students sitting double at a single desk. I taught five sections of twelfth grade government, one of which was a "sheltered" class (meaning that my students were intermediate ELLs). Having had very little training in ELL pedagogy, I was devastated that most of the sheltered students were failing my class because I could not provide the proper language support for them. Another major source of conflict was a cultural and social disconnect between me and my students: I was from a white, middle class background, and many behavioral disputes would inevitably end with a student accusing me of "being racist." This hurt deeply, but I had no idea how to address these issues, for myself or with my students.

I had very little interaction with other teachers, so I lacked guidance for effectively meeting the diverse needs of my students, bridging the cultural gap in my classroom, or dealing with the emotional trauma I experienced as a result of what I perceived as failure. I was never observed teaching, so I had no idea if what I was doing was considered effective by professional standards. I tried my best to use the knowledge I was learning in my multicultural education-oriented teacher preparation program, along with the memories of the teaching of my favorite history teacher, Ms. Mapp, who did exciting things like have us construct a life-size board game to illustrate the major battles

of World War I. Thus I structured my classes around hands-on activities as much as possible. Because my classes were so challenging, these activities often dissolved into chaos, and I would have to yell to get the attention of my students. I hated being a teacher that raised her voice, but I was at a loss for other ways to maintain order. In the struggle to provide any sort of lesson in an organized way, more active learning often became lecturing or having students do seat-work, despite my intentions otherwise.

I could have been a statistic, one of the staggering 50% of teachers that leave the profession within the first five years of their career (Ingersoll, 2001; 2003). That first year, I taught by trial-and-error method, often falling back on autocratic methods of classroom discipline to control the classroom. My own inability to put into practice what I was learning in my multicultural education classes filled me with self-loathing, and by the end of my first year of teaching I was in a deep depression. I felt isolated and inadequate, left to my own devices to stew about my failure to support my ELLs and low-performing students and unsure how to address the cultural chasm that existed in my classroom. Despite these circumstances, I survived, I learned, and I eventually made my way to a school with a more collaborative school culture and supports for developing practice that bridged foundational skills, built relationships with students, and promoted high-level learning.

After teaching for three years, I was recruited into a school leadership position, where I became intimately familiar with the issues of teacher preparation and attrition. Each year brought an influx of new teachers, most of whom had completed their student teaching in more affluent areas with a more homogenous, white student population, as

most urban schools in the area did not accept student teachers given their high numbers of teachers who were new, under-credentialed, teaching out of their certification field, or simply unqualified for mentoring. These new teachers needed to learn about the student population, community, and school culture. They also needed to gain the trust and respect of the students, who had been conditioned to expect their teachers to abandon them. I began to develop an interest in preparing and supporting teachers for, and in, urban contexts, specifically ones that are committed to engaging, empowering teaching methods rather than the "pedagogy of poverty," a deficit-based, directive, bare-bones approach to instruction that has characterized teaching in urban schools in the modern era (Haberman, 1995/2010). I felt that this type of preparation would help to mediate high rates of attrition in urban schools and such teachers would be able to help urban students ignite their love for learning. This led me to pursue my doctoral studies in teacher education, where I was fortunate to be able to work with an urban teaching residency program grounded in problem-posing pedagogy (Freire, 1970) and the idea of inquiry as stance (Cochran-Smith & Lytle, 1999) that sought to educate teachers in the same context in which they would eventually teach.

When I began taking coursework for my doctorate, I had a rather linear and sequential view of teacher learning and practice, and connections between the two, that approximated the classic "to, with, and by" model of teaching: first the knowledge and skills needed are taught *to* the teacher in the university; then the teacher puts that knowledge into practice *with* a mentor teacher; then the teacher begins teaching *by* herself. With practice and time, she develops from beginner to expert. However, from

reading the teacher education literature, my own research and work with an urban teaching residency, and personal reflection on my own teaching experience, I began to understand that beginning teaching practice is not a linear, process-product event that the teacher controls. My thinking was further informed by theories of non-linear development such as complexity theory and rhizomatics, which consider all social systems to be comprised of dynamic parts or forces that are constantly interacting and affecting one another in an ongoing process, perpetually in the middle of development. Thus, I came to view teaching as a complex, open-ended process that is continually becoming as a result of the interaction of a multitude of factors and forces, such as the teacher (e.g., her history, her education, her previous experiences, her personal characteristics), her environment (e.g., the classroom and students; the school and colleagues, administrators, and collective school values), and the work of teaching itself (e.g., planning, instructional activities, and in-the-moment responses to students).

From these interests and understandings, my dissertation question emerged, one that would marry my interests in innovative urban teacher preparation, the first year of teaching, and social-justice focused practices: "Given their common experiences of preservice preparation in a hybrid urban teacher education program, how do three first-year teachers negotiate their pre-professional learning within their new environments as they construct their practice?"

Chapter One: Introduction

The transition from the university to the classroom is a notoriously difficult time for new teachers (Allen, 2009; Flores & Day, 2006; Huberman 1989; Veenman 1984). The first year of teaching is often fraught with instructional, personal, and organizational challenges (Veenman, 1984) as new teachers attempt to bridge the divide between their studies and the reality of teaching, a dilemma that Feiman-Nemser and Buchmann have referred to as the "two-worlds pit-fall" (1985) and others have labeled the theory-practice disconnect (e.g., Zeichner, 2010a). Survival is often a prevalent theme of the empirical research literature on novice teaching (Chubbock, et al., 2001; Eldar, et al., 2003; Feiman-Nemser, 1993; Sabar, 2004) and the teaching practices that new teachers adopt to ensure survival within their new environments is often consistent with transmission-oriented teaching, even when prepared in more learner-centered, socially just ways (Allen, 2009; Cady, Meier, & Lubinski, 2006; Flores & Day, 2006; Hong, 2010).

With the daunting challenges the first year of teaching holds, combined with inconsistent opportunities for quality mentoring (Wang, Odell, & Schwille, 2008), often unsupportive workplace environments (Moore Johnson, 2006), and frequent assignment of extremely challenging classes (Scherff, 2008; Tait, 2008), it is disturbing, but not entirely surprising, that approximately half of all new teachers leave the profession within three to five years (Ingersoll, 2001; 2003). The "revolving door" of teachers (Ingersoll, 2001) further adds to the instability and resource-poor environments of low-income public schools and exacerbates teacher shortage, particularly in high needs areas—the settings where new teachers are most likely to begin their careers (Darling-Hammond,

2010). Not only does the revolving door of teachers hurt urban student development and further burden our most vulnerable schools, but according to the National Council on Teaching and America's Future (2007), this huge teacher turnover also costs the United States upwards of seven billion dollars per year.

New teachers that do survive the tumultuous transition from the university to the classroom are likely to become socialized into traditional patterns of teaching, even when prepared to teach in innovative ways that break with tradition. By "traditional" teaching, I mean the entrenched patterns of teacher-led instruction informed by a behaviorist philosophy, also known as transmission teaching. Freire (1970) characterizes this tradition as the "banking" method of teaching—teachers make "deposits" of knowledge into students, who are considered empty receptacles to be filled with teacher-provided information. As such, students are positioned as passive receivers, rather than the active learners for which Dewey (1938) advocates. In such a model, classrooms are characterized by control, competition, ranking, separation, and surveillance (Foucault, 1980). Authoritarian classroom management (Hargreaves & Jacka, 1995; Stanulis, Fallona, & Pearson), teacher-centered instruction (Allen, 2009; Luft, 2009; Saka, Southerland, & Brooks, 2009), within-class ability-grouping (Allebone, 2009) and tracked classes (McDonough, 2009) are all characteristics that might be found in schools and classrooms of teachers subscribing to the more traditional transmission model of teaching.

Such patterns of schooling have been critiqued as failing to equip students with necessary skills to compete in a global economy (Darling-Hammond, 2006). Because

this type of education tends to be more prevalent in urban schools (Haberman, 1995; Achinstein, Ogawa, & Speiglman, 2005), researchers and theorists have also argued that transmission model practices reproduce and expand entrenched inequalities in our society (Bourdieu, 1973; Haberman, 1995; Lipman, 2004). In the past several decades, an increasing number of researchers and educators have advocated for instructional practices that are more in keeping with an active, learner-centered, constructivist approach to learning (Dangel & Guyton, 2004) that is responsive to the needs of the increasingly diverse student population (Villegas & Lucas, 2002) and takes an explicit social justice focus (Cochran-Smith, 2004). Subsequently, many teacher preparation programs have begun to focus their curriculum around such teaching (Black & Ammon, 1992; Casey & Hawson, 1993; DeJong & Groomes, 1996; Goodman & Fish, 1997; Rainer, 2002). This wide-ranging continuum of practices, which I term *equity-minded teaching,* draws from frameworks such as "teaching for social justice" (Ayers, Hunt, & Quinn, 1998; Cochran-Smith, 2004; Kohl, 2002), "culturally relevant teaching" (Ladson-Billings, 1995), "culturally responsive teaching" (Gay, 2000; Villegas & Lucas, 2002), "critical pedagogy" (Freire, 1970; Giroux, 1988; Hinchey, 2001; Shor, 1992), and "democratic education" (Apple & Beane, 1995; Darling-Hammond, 1996; Dewey, 1916). While some might argue that the frameworks named above emerge from different theoretical traditions and pursue somewhat different goals, I believe they broadly share a goal to disrupt the status quo of entrenched inequalities further perpetrated by schools and move toward a more equal society. For this reason, I refer practices encompassing the spectrum referenced above as "equity-minded teaching."

Some evidence exists of equity-minded teaching in the classrooms of first-year teachers, including culturally and linguistically responsive teaching or other practices aimed at inclusion of diverse students (Bergeron, 2008; Chubbock, 2008, Cook, 2009; McAlpine & Crago, 1995; McElhone, et al., 2009), student centered and inquiry based teaching (Bianchini & Cazavos 2007; Luft 2009; Saka, Southerland, & Brooks 2009; Towers 2010), reflective practice (Chubbock et al 2001; Kilgore, et al 1990; McDonough 2009; Tait 2008), and fostering connections with students and their families (Eldar, et al 2003; He & Cooper, 2011; Hebert & Worthy, 2001; Romano & Gibson, 2006). Despite pockets of teaching against the status quo, however, teaching in the United States has remained relatively unchanged over the past century, with most classrooms are still characterized by the kind of authoritarian, teacher-led instruction decried by Dewey (1916/1938) around the beginning of the last century (Cuban, 1993). Such practices are particularly evident in urban settings (Haberman, 1995), where prescriptive curriculum and accountability measures have been particularly invasive (Solomon, Singer, Campbell, & Allan, 2011). That equity-minded practices are being enacted in some first-year teacher classrooms in the face of such rigid conditions raises interesting questions regarding the conditions that enable and support such practices, particularly in our high minority and poorly resourced schools.

Researchers have documented multiple factors that influence high attrition among beginning teachers and the tendency to adopt traditional patterns of teaching. These include difficulty transferring preservice learning from the university to classroom settings (Allen, 2009; Beck, Kosnik, & Rowsell, 2007), reality shock (Chubbock, 2008;

Farrell, 2003; Hargreaves & Jacka, 1995), assignment of the most challenging classes (Scherff, 2008; Stanulis, Fallona, & Pearson, 2002; Tait, 2008), lack of support from mentors or administration (Castro, Kelly, & Shih, 2010; Fry, 2007; He & Cooper, 2011; Hebert & Worthy, 2001), school cultures that enforce more conservative educational norms (Saka, Southerland, & Brooks, 2009; Ferguson-Patrick, 2011), and/or pressure of accountability policies (Allebone, 2009; Brashier & Norris, 2008; He & Cooper, 2011). While the literature regarding first-year teaching contains rich description of interactions at the school level that contribute to teacher attrition and enactment of conservative instructional practice, few studies actually provide in-depth description of what occurs between teachers and students in the classroom setting. Studies of first year teaching often refer to struggles with classroom management and adoption of more teacher-centered practice, but offer little examination of *why* or *how* this occurs. Detailed, rich descriptions of the classroom interactions that inform emerging instructional practices are essential to understanding how we can better support new teachers in enacting equity-minded practice.

Reform and Teaching

The challenges faced by teachers entering the workforce have always been daunting, but the current era of corporate reform is a particularly trying time to become a teacher. Under what Sleeter (2008) refers to as " a marriage between neo-liberalism and neoconservatism" (p. 1947), public education is being threatened from a bi-partisan effort to privatize public education, increase standardized testing, eliminate teacher protections such as tenure, close low-performing schools and open charters in their wake, institute

voucher programs for private schools, and standardize curriculum (Karp, 2012; Lipman, 2011). A multitude of research has surfaced that problematizes these reform moves. Studies have shown, for example, that increased testing narrows curriculum (Center on Education Policy, 2006) and has resulted in the "push-out" of low-performing or "at-risk" students (Darling-Hammond, 2010) rather than increased achievement for all. Others have demonstrated that charter schools underserve minorities, special needs students, and ELLs (Civil Rights Project, 2009), and only 17% of charter schools actually report gains higher than their public counterparts (CREDO, 2009). However, despite the volume of scholarly work decrying what some have termed "corporate education reforms" (Karp, 2012)—due to both the pervasive market logic that undergirds them and the financial backing of their proliferation by corporate interests (Ravitch, 2011)—politicians and educational leaders continue to impose these reforms in schools and districts.

Occurring parallel to the privatization push in K-12 education is a systematic dismantling of teacher education and de-professionalization of the work of teaching itself (Sleeter, 2008; Zeichner, 2010a). Proponents of deregulating teaching cite the ineffectiveness of preservice university-based education (Finn, 2001; Goldhaber, 2002; Levine, 2006) and consider certification a "deterrent" to many talented professionals whose "practical experience and maturity…make them attractive candidates for teaching" (Ballou & Podgursky, 1998, p. 26). As deregulationist views have gained traction within educational politics (Zeichner, 2003), many districts and states have developed alternate routes to certification, most of which include minimal (or no) teacher education coursework or clinical practice prior to entering the classroom (Baines, 2010; Darling-

Hammond, 2006), instead replacing preservice teacher preparation with "on the job training" (Hess, 2002, p. 170).

In response to critiques of both university-based teacher education programs, which tend to separate theory and practice, and alternate route programs that provide little or no preparation for teachers prior to assuming formal responsibility for a classroom, new "hybrid" programs have taken root. Hybrid teacher education programs mesh university and school-based forms of teacher education, featuring close connections between coursework and clinical practice, and seek to bring together academic and practitioner knowledge in new, non-hierarchical ways in a "third space" (Zeichner, 2010b, p. 93). Such programs often are situated in schools rather than universities, offer an apprenticeship-style experience that integrates theory and practice, and continue to support the new teacher through the induction phase (Berry, Snyder, & Montgomery, 2008). Over the last several decades, several initiatives have attempted to bridge the school-university disconnect, such as the Professional Development School (PDS) movement (Darling-Hammond, 1994), intensive school-university partnerships that include early entry to teaching practice (Bullough, Burrell, Young, Clark, Erickson, & Earle, 1999), and teacher education programs with increased or earlier field experiences (Darling-Hammond & Bransford, 2005). However, such programs often continue to evidence a divide between what is learned on the university campus and what is practiced in the schools (Zeichner, 2010a). Recently, amid a political atmosphere clamoring for higher student achievement and teacher accountability, the United States federal government has thrown its weight behind one type of hybrid teacher education program,

the Urban Teacher Residency. In 2009 and 2010, many such start-up programs received federal grants collectively totaling nearly one hundred and fifty million dollars (U.S. Department of Education, 2009; U.S. Department of Education, 2010).

Such programs hold potential for supporting new teachers' transition to teaching and enactment of practice. In particular, research-based evidence supports two of the features of hybrid teacher education programs—the year-long practicum in the urban district in which teachers will eventually work and the induction support provided through the novice phase. Studies have shown that a match in environments between the practicum and the first-year teaching placement lessens reality shock for new teachers (Hebert & Worthy, 2001; Lambson, 2010; Luft & Roehrig, 2005). In addition, induction support provided by the teacher education program during the graduates' first year of teaching helps reinforce the enactment of progressive pedagogies learned as part of their preservice preparation (Luft, 2009; Luft & Roehrig, 2009; Hollingsworth, 1992; Stanulis, Fallona, & Pearson, 2002). But while the premises of these programs are promising, little is known about the practices of program graduates apart from positive reports from administrators and early retention rates of program completers (Berry, Snyder, & Montgomery, 2008). No empirical research exists that describes the practices of graduates of such programs.

The Northeastern Urban Teacher Residency

When I started my doctoral studies in 2010, I had the opportunity to work in a hybrid urban teacher preparation program, the Northeastern Urban Teacher Residency (NUTR) (a pseudonym), as part of my research fellowship. Over the course of two years, I collected data about the program and its participants, assisted with course assignments, and led workshops with residents. The program and its foci aligned well with my own interests in urban teacher preparation and teaching for social justice, and I became committed to the vision of the program. As time went on, my interests further narrowed to first-year teachers in urban settings. In the fall of 2011, I served my practicum as an induction coach, providing support to the first year teachers who were graduates of the residency. During the past year, working with the program and watching the development of NUTR graduates led me to my current study focus, which begins with a common experience of three teachers in the NUTR.

The NUTR program mirrors, in part, the urban teaching residency model (Berry, Montgomery, & Snyder, 2008), featuring a year long apprenticeship in an urban school accompanied by teacher education coursework. While commonalities do exist, several unique features distinguish this particular program from other teacher residencies and may inform the participants' practices in unpredictable ways, and thus a thorough description of the program is warranted. The NUTR features a deeply collaborative and equal-status partnership between a university and school district, a philosophical grounding emphasizing equitable power relations among stakeholders, extremely rigorous admission criteria, a focus on social justice and inquiry-based teaching with a

strong emphasis on theoretical foundations, and community education component. Because of these unique characteristics, which are not typical of an urban teacher residency, I deliberately refer to the program as an "urban hybrid teacher education program" rather than a residency.

The program was born of a long-standing partnership between a large public northeastern university and nearby urban school district. The two entities collaborated to create a program to specifically address a major area of shortage in the urban district—quality secondary math and science teachers. During the 12-month period, NUTR participants receive a $26,000 stipend and tuition, and upon successful completion of the program, residents receive a Masters of Arts in Teaching and a full teaching credential. Graduates sign a contract that commits them to three years of teaching in the urban district. Through this program, the university and urban school district hope to create a sustainable pipeline of math and science teachers specifically prepared to educate youth from this community. The program specifically screens for applicants who are not only academically strong, but also have certain dispositions, including the ability to collaborate productively, a commitment to teaching urban youth, and persistence and resilience in the face of adversity (Haberman, 1995). To select residents of this high caliber, potential candidates participate in a rigorous, three-day admissions process involving an application review, individual and group interviews, and school-based interactions.

The program is grounded in the concept of creating a "third space" in teacher education (Zeichner, 2010a), which I argue aligns with the social justice agenda in

education. Traditionally, university-based teacher education has provided an experience for future teachers that is characterized by various disconnects, with divides between theory and methods coursework; coursework and practical experience; and the faculty supervisor and the collaborating teacher (Grossman, et al, 2009). By creating a third space, programs might realign traditional power relationships (Bhabha, 1994) and construct an alternate arena where the roles of the university, school, teacher candidate, and community can be reimagined. In the third space, each stakeholder is considered to have valid and equal knowledge, and each has a voice in the construction of the program. In keeping with the third space realignment foundation, the traditional structures of university-based teacher education are restructured: instead of a separate period of learning and practice, both are encompassed within the one year apprenticeship; the resident learns in and from practice, simultaneously having the opportunity to learn about teaching while experiencing it, debriefing with expert others and peers about their experiences, and reflecting on them. Furthermore, classroom-based mentor teachers are considered to be teacher educators alongside the university faculty members, collaborate in the construction of curriculum, and lead assignments such as the residents' action research. Through the realignment of traditional roles of teacher preparation and a fusing of learning and practice, the NUTR has attempted to bridge the school-university, theory-practice divide and trouble the traditional power structures that often complicate school-university partnerships (Zeichner, 2010a; Klein, Taylor, Onore, Strom, & Abrams, 2013). However, a third space is always a utopian endeavor, and is never fully actualized. While the NUTR has gained some ground in their attempt to create a third space, challenges

abound, and the process is never easy or finished (Klein, Taylor, Onore, Strom, & Abrams, 2013).

The NUTR is grounded in a social constructivist philosophy of learning (Vygotsky, 1978; Mehan, 1981) and seeks to promote a transformative conception of teaching and learning espousing an inquiry based, dialogical, problem-posing pedagogy that positions students as active meaning makers (Freire, 1970). Program faculty provide coursework experiences that model the practices of such inquiry-based teaching as well as help residents acquire deep understanding of their own learning processes through inquiry cycles of actively questioning, investigating, acting, dialoguing, reflecting, and modifying (Klein, Taylor, Onore, Strom, & Abrams, 2013; Taylor & Otinsky, 2007). To ensure an educational experience that is both tailored to the individual teacher candidate as well as the students of Newark, the curriculum is negotiated and continually co-constructed by faculty and residents (Boomer, Onore, Laster, & Cook, 1992). Negotiating and co-constructing the curriculum also provides a democratic element that facilitates power-sharing and collaborative decision-making (Apple & Beane, 1995; Darling-Hammond, 1996; Grant, 2012). Additionally, the relational element of teaching is highlighted throughout the program, with multiple opportunities to experience the importance of building community, collaboration, support, and the power of human relationships and personal empathy. Social justice is an important part of the curriculum, with emphases on culturally and linguistically responsive teaching (Villegas & Lucas, 2002; Villegas & Lucas, 2011), teaching through inquiry and problem-posing (Freire, 1970), and making issues of social inequity and power imbalances explicit in the

classroom (Cochran-Smith, 2004). Residents are placed in schools, both during their residency and during their three-year term of service, in cohorts of two or more when possible.

Another unique feature of the NUTR is the six-week summer internship, during which residents work with three different community partner agencies through the summer months before their teaching apprenticeship begins. Past internships have included teaching at a science-themed museum summer camp; serving as student "relationship managers" with a local program that facilitates student internships in corporate settings; and recruiting and coordinating youth volunteers for a local non-profit's annual talent show. Working in these capacities gives residents an opportunity to get to know the community in which they will be teaching and interact with community youth in an out-of-school setting. After this experience, several of the members of both cohorts have chosen to reside in the school community.

Learning opportunities are structured around the program principles of inquiry, collaboration, reflection, and opportunities to learn in and from practice (Cochran-Smith & Lytle, 1999). To practice the skills of inquiry into teaching, studying one's own students and practice, and culturally responsive teaching, residents conduct case studies of one English language learner and one special need student, researching the students' needs, skills, and developing a plan to modify instruction within the residents' classes. During the second semester, residents collaborate with their mentors to conduct an action research project focused on a question generated about teaching practice, and participate in an inquiry cycle project specifically focused on investigating an issue of social justice

related to their content area. Another learning tool, instructional rounds, is "an explicit practice designed to bring discussions of instruction directly into the process of school improvement" through the use of "a set of protocols and processes for observing, analyzing, discussing and understanding instruction that can be used to improve student learning" (City, Elmore, Fiarman, & Teitel, 2009, p. 3). A major assignment in the first semester is developing a complete unit plan using backwards design (Wiggins & McTighe, 2005), featuring essential unit questions, and including multiple authentic assessments. One lesson from the unit plan is presented to the group utilizing a tuning protocol (McDonald, Mohr, Dichter, & McDonald, 2003) that provides a structured way to disseminate the lesson and receive input from colleagues: one resident presents the lesson, and the group mirrors what they heard and provides constructive feedback.

While engaged in preservice coursework, residents co-teach on a full time basis with a carefully selected mentor teacher who helps to design the curriculum. NUTR mentor teachers are considered co-teacher educators alongside the faculty. To simulate the first-year teaching experience as closely as possible, residents are expected to participate in the same professional tasks as a full time teacher of record, including non-instructional tasks such as attending faculty meetings. As often as possible, mentor teachers are assigned two preparation periods to provide intensive mentoring and time for collaborative planning. NUTR university faculty members observe residents frequently, collaborating with mentors to provide guidance to residents regarding classroom practice.

Community building and collaboration is another important aspect of the program. A multi-layered support network is created for the residents from day one, encompassing

not only the mentors and program faculty, but also doctoral students assigned as program assistants, department chairs, other teachers, and science and math faculty from the university. A strong emphasis is also placed on building community within and among the cohort of residents, so that they build their own support network with which they will be able to combat the perennial isolation that plagues many new teachers.

Induction support is provided for residents for the first three years of their inservice teaching. In addition to supports provided by the district, each school where residents are placed is assigned a program induction coach who serves as a general resource and additional layer of support to the resident. The program induction coach builds relationships with the residents' mentor and her supervisors and administrators, offering resources and support as needed. Furthermore, to continue to build partnerships with the schools in which residency graduates are placed, induction coaches facilitate a "leadership institute" for school leaders such as department chairs and administrators once a month. This initiative seeks not only to deepen collaborative relations between the university and the district school administrations, but also to help the school leaders in creating and implementing strategies that will provide organizational support for teachers.

Statement of Purpose

In an era of deepening socio-economic inequalities (Anyon, 2005) and massive defunding of public education (Zeichner, 2010a), preparing and supporting high quality, committed novice educators to instruct a diverse population of students in high-poverty urban schools must be a top priority. Understandings of first-year teachers' processes of

negotiating preservice learning and enacting equity-minded practice can give teacher educators, whether at universities or other educational institutions, insight into how to meet the needs of new teachers and to provide support for the specific teaching practices they endorse during the challenging transition to teaching. In addition, an investigation of the influence of a hybrid urban teacher education program can inform teacher preparation reform efforts focusing on practice-based teacher education in urban settings. While the federal government has invested large sums of taxpayer dollars in hybrid teacher education programs in the last three years, there is a dearth of in-depth studies of the lived experiences of graduates of such programs. The newness of the hybrid model and a federal focus largely emphasizing research regarding student achievement while ignoring teacher development may contribute to this gap.

This dissertation study aims to add to research on processes of practice in the first-year of teaching as well as the slim but growing body of empirical literature regarding urban hybrid teacher preparation programs. This study investigates the enactment of teaching practice of three first-year graduates of an urban hybrid teacher education program located in the northeastern United States. A framework informed by equity-minded pedagogy and rhizomatics provides for an overall theory of educational change rooted in an agenda of social justice in education, and a classroom-level analysis of the first-year teacher as part of a larger constellation of interconnected, interdependent, and interacting parts, rather than an isolated, autonomous actor with absolute agency. This perspective also allows for an analysis of teaching practice as emergent processes arising from multiple, ongoing interactions between a confluence of factors and forces at

work in the teaching setting, rather than a single “cause-effect” transaction. To attempt to express teaching as complex and non-linear, I use rhizomatic mapping and postmodern grounded theory (Charmaz, 2002; Clarke, 2003) to construct case studies (Yin, 2009) that invite readers to experience the dynamic workings of the classroom.

Chapter Two: Conceptual Framework and Literature Review

Conceptual Framework

> Public schools are perhaps the only institution that is positioned to play a role in addressing the effects of poverty and social marginalization and furthering the goal of equity. (Noguera, 2003, p. xxvii)

In its current form, our education system is not the "balance wheel of the social machinery" that Horace Mann (1846, p. 2) envisioned. More often, schooling in the United States has been, and continues to be, an engineering force in the creation and maintenance of a deeply stratified society (Bourdieu, 1973; Kozol, 1991/2005; Thomas 2013). Yet, as Noguera (2003) notes, the institution of schooling, and the work of teachers implicated therein, *does* provide a possibility of social transformation. This study encapsulates and builds on the work of many scholars, researchers, and philosophers of education who have imagined such transformative purposes for schools, particularly practices with the potential to increase educational equity (e.g., Cochran-Smith, 2004; Dewey, 1916/1938; Freire, 1970; Ladson-Billings, 1994; Villegas & Lucas, 2002/2007; Walqui & Van Lier, 2010). While many universities include coursework regarding such practices (Cochran-Smith, 2004; Villegas & Lucas, 2002), the process of transferring new teachers' learning to their new classrooms and enacting equitable practices in urban schools has remained elusive. Thus, the conceptual framework for this study reflects a larger frame of education for social justice, complemented by concepts from rhizomatics (Deleuze & Guattari, 1987), a poststructural school of thought that provides a way to conceptualize the work of the teacher as complex, open-ended,

contextually situated phenomena. I begin by positioning my work in a larger frame of education for social justice, providing an overview and critiques of the historical norm of transmission teaching, followed by a discussion of what I term *equity-minded pedagogy.* The second section of the conceptual framework introduces rhizomatics, presents specific rhizomatic concepts germane to this study, and concludes with a discussion of the potential of this framework as a tool for studying the day-to-day work of the teacher.

Education for Social Justice

The United States is supposedly a land of the free, a land of equality and opportunity. Yet, we are a society of increasing segregation and inequality (Anyon, 2005). In 2013, nearly one in four children live at or below the federal poverty line, and one out of every two children lives at a "basic needs" level—at an income that sustains, only barely, necessities for survival such as food and shelter (National Center for Children in Poverty, 2013). Poverty crosses lines of race, language, and class, with higher populations of people of color, women, and immigrants living in poverty than other groups (U.S. Census Bureau, 2012; Redd, Karver, Murphey, Moore, & Knewstub, 2011). Because academic access is tied to property and privilege (Ladson-Billings & Tate, 1995), these deepening inequalities are echoed in our schools, a situation that amounts to educational apartheid (Kozol, 2005).

Generally schools that serve more affluent, white populations are more likely to have adequate facilities, up to date resources, properly credentialed and experienced teachers, a school environment that provides freedom and choice, and curriculum and pedagogy characterized by active, meaningful learning (Ibid). Meanwhile, the "savage

inequalities" (Kozol, 1991) of high poverty schools (which are more likely to serve students of color, English language learners, and special needs populations) have been well documented (e.g., Anyon, 1997/2005; Blanchett, Mumford, & Beacham, 2005; Darling-Hammond, 2010; Kozol, 1991/2005): dilapidated facilities, chipped and broken desks, outdated textbooks, metal detectors, under-credentialed and inexperienced teachers, and test-driven, basic skills curriculum characterized by rote and drill are more often the norm. Compounding these inequalities are neoliberal policies that have taken hold of our educational system in the past thirty years, punishing the most vulnerable populations in the highest poverty schools in the name of accountability (Hursh, 2001/2005/2007; Darling-Hammond, 2007). As Kozol (2005) notes in his nationwide study of schooling inequalities in the US,

> There is something deeply hypocritical in a society that holds an inner-city child only eight years old 'accountable' for her performance on a high-stakes standardized exam but does not hold the high officials of our government accountable for robbing her of what they gave their own kids six or seven years before. (p. 53)

Although mainstream educational research tends to ignore students as part of the larger school context (Bullough, 2008), the students who attend urban schools are very aware of the inequalities of our school system and larger society. Many students do not meekly accept their given roles as passive consumers in the classroom, instead engaging in acts of oppositional behavior to resist institutional power, avoid assimilating to dominant cultural norms, and/or protect their own cultural identities (Giroux, 1983;

McLaren, 1989/2002, Willis 1977). Student oppositional behavior toward dominant educational forms includes indirect acts of resistance, such as absenteeism and refusal to engage in work, as well as more active tactics that interrupt or disrupt classroom function. The historically marginalized populations most likely to attend urban schools (Kopetz, Lease, & Warren-Kring, 2006), faced with evidence of inequities in school and in their own communities, may also experience a general ambivalence toward the idea that hard work in school leads to improved economic circumstances (Ogbu, 1982/1986; Ogbu & Simons, 1998). That is, students belonging to marginalized groups are "less sure that education leads to success or helps to overcome barriers to upward mobility" (Ogbu & Simons, 1998, p. 172). Seeing few adults in their lives who have achieved the success promised by meritocratic "folk theories" (p. 172) about school, students from non-mainstream backgrounds may not see purpose in the institution of school or activities taking place there, which in turn may lead to student resistance in the classroom (Villegas & Lucas, 2002). While some researchers have suggested coordinated student resistance can, and has, led to legitimate challenge of institutional dominance (Solorzano & Delgado-Bernal, 2001), others contend that oppositional behavior mainly reinscribes patterns of social reproduction, with students' related school failure feeding into the cycle of educational inequality (Giroux, 1983).

The increasing stratification of education opportunities in the United States has not gone unchallenged. In the past decade or more, a social justice movement in education has developed parallel to these trends (Cochran Smith, Shakman, Jong, Barnatt,

and McQuillan, 2009). While the educational social justice agenda is indeed broad, it is possible to identify key tenets. Cochran Smith, et al (2009) note,

> "This perspective is based on recognition of significant disparities in the distribution of educational opportunities, resources, achievement, and positive outcomes between minority and/or low-income students and their white, middleclass counterparts. This recognition of disparities is coupled with the position that teachers can and should be both educators and advocates who are committed to the democratic ideal and to diminishing existing inequities in school and society by helping to redistribute educational opportunities" (p. 7).

Broadly, the social justice paradigm illuminates the ways that schooling and traditional pedagogies reproduce societal inequalities, provides conceptions of teaching that differ from the dominant pedagogy, and highlights the possibilities of teaching as a method of social change. My study takes place in schools ravaged by inequality, and I am investigating the negotiation of practices of new teachers serving mainly marginalized populations of students. To produce thinking on the subject of preparing and supporting new teachers to enact practices promoting educational equity for historically underserved students in urban schools speaks to an agenda of social justice in education. For these reasons, I adopt a social justice perspective for my study. While the study is framed by a social justice agenda in a larger sense, I specifically focus on educational philosophy and teaching practice supporting equity for all students, which I term *equity-minded pedagogy*.

Such a pedagogical approach is not new, but draws from multiple theoretical perspectives, including social constructivism/socio-cultural learning theory (Mehan,

1981; Vygotsky, 1978), critical pedagogy (Freire, 1970; Giroux, 1988; Hinchey, 2001), and social reproduction theory (Bourdieu, 1973). This perspective also builds on overlapping pedagogical frameworks, such as culturally relevant/responsive teaching (Gay, 2000; Ladson-Billings, 1994; Villegas & Lucas, 2002); democratic teaching (Apple & Beane, 1995; Ayers, 2009; Dewey, 1916); linguistically responsive teaching (Ruiz, 1984; Villegas & Lucas, 2011); and teaching for social justice (Au, Bigelow, & Karp, 2007; Ayers, Hunt, & Quinn, 1998; Cochran-Smith, 2004). Equity-minded pedagogy is intended to interrupt the dominant pedagogical norm of urban schools—transmission teaching, or what Haberman (1995/2010) terms the "pedagogy of poverty." Before explaining my conception of equity-minded pedagogy, I give a brief overview of transmission teaching and discuss the limitations of this type of pedagogy from a social justice perspective.

Transmission teaching. Transmission teaching, also known as direct instruction, lecture, or direct transmission, has dominated instruction—both formal and informal—for the past millennia (Cohen, 1988). This "teacher as teller" tradition, described by Freire (1970) as the "banking model" of education, positions the teacher as the expert/authority who imparts knowledge as "truth" to passive students. From a transmission perspective, teaching is an act of transmitting knowledge, and learning is an act of being filled with whatever the teacher imparts. That is, the job of the teacher is to make "deposits" into students, who are considered empty receptacles. In this model of instruction, knowledge refers to previously recorded information, and knowing means the amount of facts one has memorized (Hinchey, 2000). Despite the historical dominance of this pedagogical

tradition, many educational philosophers and researchers have noted multiple negative aspects of teaching through transmission (e.g., Dewey, 1938; Freire, 1970; Villegas & Lucas, 2002). Below, I summarize the social, cultural, and pedagogical critiques of this instructional paradigm.

Critiques of transmission teaching. From a social perspective, teaching as transmission serves as a form of societal indoctrination and control (Freire, 1970). By conditioning students to be passive, meek, powerless receivers of knowledge who are receptacles to be filled or clay to be molded, the "banking method" of education serves to perpetuate asymmetrical social power relations: "Translated into practice, this concept is well suited to the oppressors, whose tranquility rests upon how well men fit the world that the oppressors have created, and how little they question it" (Friere, 1970, p. 63). Through the stated and implicit school curriculum, the norms and ideologies of the dominant culture are imparted to youth (Apple & Beane, 1995; Bourdieu, 1973) and "regimes of truth" (Foucault, 1980) are perpetuated as students are taught to be obedient and quiet, not to question teachers or authorities within the school, and to accept the information they are given as gospel. This model stresses the binaries, or the separations, that keep populations of the oppressed from understanding the world holistically and joining together in solidarity to collectively question hegemonic structures and work to interrupt them (Freire, 1970).

The dominant pedagogy also determines the distribution of cultural capital—often non-tangible assets that provide particular benefits socially—among classes (Bourdieu, 1973). The language of school is based on dominant ideology and culture. Non-

mainstream students do enter school with language and cultural resources, but because they may not be conversant with dominant discourses of formal education, they are placed at a distinct disadvantage (Schleppegrell, 2004). If students who possess cultural capital differing from that of the dominant group are provided pre-packaged information to assimilate whole, they are likely to struggle making sense of it and in the process become disenfranchised from their education. As Bourdieu (1973) argues,

> An educational system which puts into practice an implicit pedagogical action, requiring initial familiarity with the dominant culture, and which proceeds by imperceptible familiarization, offers information and training which can be received only by subjects endowed with the system of predispositions that is the condition for the success of transmission and of the inculcation of the culture (p. 80).

Because students from more affluent backgrounds are more likely to already enter school with this "initial familiarity," or cultural capital, they are set up for academic success. Those who are not (and are not provided appropriate supports to learn the dominant discourse) most likely face failure. As educational attainment is tightly connected to life success, this pattern then results in the reproduction of class relations and the maintenance and expansion of inequalities present in society (Bourdieu, 1973).

From a pedagogical perspective, teaching as transmission precludes any actual *thinking work* on the part of the student, which effectively eliminates opportunity for creative development on their part and ensures that students work to fit into the world as it exists rather than recognize their role as active constructors of their own understanding

of, and role in, the world (Dewey, 1938; Freire, 1970/1998). This teaching method also conflicts with sociocultural understandings of *how students learn* currently recognized within education circles (e.g., Black & Ammon, 1992; Villegas & Lucas, 2002; Cochran-Smith, 2004; Vygotsky, 1978; Walqui & van Lier, 2010; Windshitl, 2002). From this perspective, meaning is made not by information osmosis, but by actively working with ideas in a socially interactive environment. Learning occurs as appropriate scaffolds are provided to assist the student in accessing more challenging concepts (Vygotsky, 1978). The most powerful learning happens ecologically, with curriculum functioning as "interacting constituent elements of the whole" (Freire, 1970, p. 95). Rather than facilitating learning as connected wholes, however, the traditional structure of schools promotes a fragmented vision of reality by dividing subjects into discrete disciplines, breaking knowledge into discrete bits of information, and separating conceptual and procedural learning (Dewey, 1938).

Because the primary role of the student within the transmission model of education is to receive pre-packaged information from the teacher, students can actively choose to quietly "not-learn" (Kohl, 1995). That is, this type of teaching provides an easy way for students to resist—by merely disengaging from listening to the teacher. In so doing, students refuse to cooperate with an oppressive institution and preserve their own identities, but do not necessarily have to take any type of action. In contrast, equity-minded pedagogy, which is discussed next, requires students' active participation in engaging with tasks of higher autonomy and cognitive complexity (Cochran-Smith, 2004; Villegas & Lucas, 2002). The vulnerability students may feel from these more

challenging undertakings, the denial of a way to passively disengage from academic activities, and students' general mistrust of schooling may contribute to teachers' experiencing higher levels of student resistance to this type of teaching than to transmission instruction.

Equity-minded pedagogy. From the time of the creation of mass schooling in the United States, educators and philosophers have made passionate pleas to break with the historical norm, the "banking" model of teaching (Freire, 1970). Mark Twain, Henry David Thoreau, and other "Romanticists" insisted that education should be an adventure, something one must experience out in the wilds of nature, and was not an undertaking that could be contained in a classroom (Cohen, 1988). Throughout the twentieth century, a rich body of theory and research articulating conceptions of teaching differently, not only to elevate the learning experience but as a form of resistance to education's role in the reproduction of socioeconomic and cultural inequality, gave rise to the movement of social justice in education. Below, I detail a vision of teaching for equity situated in social constructivist learning theory (Vygotsky, 1978) and drawing from multiple frameworks of equitable teaching practice (e.g., Cochran-Smith, 2004; Ladson-Billings, 1995; Villegas & Lucas, 2002/2011; Walqui, 2006). As used in this study, equity-minded pedagogy encompasses three major components: learner centered instruction, responsive and relevant teaching, and critical teaching perspectives.

Learner-centered instruction. While some researchers and educators might argue that learner-centered instruction is not explicitly a practice working toward the goal of educational equity, I contend that this type of teaching supports equitable teaching goals

in multiple ways. Adopting this type of pedagogy allows the teacher to tap into students' resources/cultural capital to help them make meaning, thus providing access points to the dominant curriculum that traditionally excludes them. Moreover, learner-centered instruction supports teachers' creation of lessons that are more relevant and meaningful for students; builds students' understanding of their role as knowledge constructors; and assists students in developing an active (rather than passive) stance toward learning, which in turn helps them become independent thinkers and doers who are not positioned as powerless victims in society (Villegas & Lucas, 2002). To develop a discussion of learner-centered teaching, I first provide an overview of the underlying learning theory of social constructivism and its implications for equitable instructional design. I then detail two types of learner-centered pedagogy, democratic teaching and inquiry-based instruction.

Social constructivism. While not all constructivists would situate themselves in a social justice paradigm, equity-minded educators and researchers predicate their beliefs on a critique of positivism—the belief in objective truth, one "right" way of thinking, and bodies of knowledge that are "correct" (Giroux, 2002). This epistemology has resulted in obscuring the value-based, constructed nature of knowledge, and thus privileging particular forms of knowledge and ways of knowing in schools while marginalizing others. Because constructivism recognizes the collaboratively constructed nature of knowledge and learning processes, this learning theory undergirds most conceptions of teaching for equity (Hinchey, 2000). Grounded in the view that knowledge is a socially constructed, value-based, human creation, constructivism is a continuum of beliefs about

learning positing that students learn through a filter of their previous knowledge and experiences (Fosnot, 1989; Piaget, 1954; Villegas & Lucas, 2002; Vygotsky, 1978; Windshitl, 2002). Because knowledge is created—not existing *out there* fully formed—the more traditional, rationalistic view of knowledge as objective and neutral is problematized and space is created for the validation of multiple perspectives and knowledges (Belenky, Clinchy, Goldberger, & Tarule, 1983; Hinchey, 2000; Villegas & Lucas, 2002).

The learning perspective that grounds the present study most closely approximates social constructivism (Dewey, 1925, Mehan, 1981), also known as socio-cultural theory (Vygotsky, 1978). Social constructivists view learning as a socially constructed process created between the individual, group, and larger context, with language as the mediating tool (Dewey, 1925). Rather than already existing in the world, or assimilated by the individual into one's mental structure, from a social constructivist perspective meaning is created through reflective inquiry between individuals and framed by context, history, and theory. Learning occurs not solely in the individual's mind, but rather in the *zone of proximal development*,

> …the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers. (Vygotsky, 1978, p. 84)

The supports provided by an "expert other" to help students develop more complex ideas or functions in the zone of proximal development are known as *scaffolds* (Bruner, 1978).

Because learning first occurs in the social context, followed by individual internalization (Vygotsky, 1978), opportunities for students to interact with others in joint academic activity are paramount (Walqui, 2006/2011). To ensure students have such interactive educational activities, teachers have a responsibility to organize their instruction so that learners have access to other adults or peers who might help scaffold learning. As such, collaborative learning is an important aspect of learner-centered instruction. Moreover, the social constructivist view of learning is an active one. The teacher does not "transmit" information directly into students' brains. Rather, each student actively constructs her own knowledge of the information or experiences with which she engages in the classroom. Although guided or mediated by the teacher or peers in a social setting first, ultimately the process of internalization occurs on the individual plane—thus the need for *learner-centered* instruction (Villegas & Lucas, 2002).

*Democratic teaching***.** A learner-centered pedagogy aligns well with building the necessary skills to help students become active democratic citizens (Villegas & Lucas, 2002), which many educators and researchers argue is a central purpose of education (e.g., Ayers, 2009; Dewey, 1916; Darling-Hammond, 1996; Goodlad, 1990; Labaree, 1994; Meier, 2008). Speaking to the importance of a constructivist mentality in connection with democracy, Dewey (1903) noted, "To subject [a child's] mind to an outside and ready-made material is a denial of the ideal of democracy, which roots itself ultimately in the principle of moral, self-directing individuality" (p. 199). Education should provide students with a deep understanding of democracy as a way of life (Dewey, 1916) and

develop necessary skills for that life, such as independent thinking and the ability to make evidence-based decisions (Ayers, 2009). Conceptions of democratic teaching task teachers with providing the conditions that support democratic life, such as access to multiple perspectives and ideas, capacity for individual and collective problem-solving, critical reflection and analysis, concern for the welfare of the whole (not just the individual), and concern for marginalized groups (Apple & Beane, 1995; Greene, 1984).

Teaching for democracy moves beyond preparing students to be productive citizens in a democratic society and instead promotes education itself as a form of democracy, where opportunities are provided for students to develop important social skills and to understand multiple perspectives through participation in a collaborative classroom community (Darling-Hammond, 1996). Democratic teaching practices encourage classroom dialogue and deliberation, individual and collective student involvement in decision-making, and power sharing (Grant, 2012). For example, rather than the teacher creating a list of expectations and providing them to the class—a typical top-down approach to establishing community norms—the teacher and students might collectively develop a social contract that addresses the needs of the students and teacher and the ways that they will hold themselves, and each other, accountable to the community as a whole (Schindler, 2009).

Inquiry. Democratic education is also fundamentally tied to inquiry, or what Freire (1970) refers to as *problem posing*, which involves cycles of investigation, joint dialogue, and reflection between teacher and students. The resulting "dialogic relationship" between students and teacher works to blur the traditional power roles of

the classroom. Freire explains, "The teacher is no longer the one who teaches, but one who is himself taught in dialogue with the students, who in turn while being taught also teach. They become responsible for a process in which all grow" (p. 57). In adopting inquiry-as-stance (Cochran-Smith, 1999) in their teaching, educators can encourage students to investigate and question their world, interrogate their own beliefs, and explore multiple and sometimes contradictory perspectives (Freire; 1970; Freire & Macedo, 1987).

Inquiry-based learning often follows a cycle that approximates the scientific method in some respects. A typical inquiry cycle might begin with questioning or problem posing, followed by an investigation of the question or problem, creation or synthesis from investigative results, sharing and discussing the synthesis, and reflection on the process (perhaps to be followed by revising the question and beginning the cycle anew) (Bruner, 1965). Others present a variation on this cycle that perhaps might begin with a "wondering and wandering" phase to spark a question or investigative impetus (Short, Harste, & Burke; 1989; Taylor & Otinsky, 2007) or result in action that emerges out of the problem posing, investigation, and dialogue (Freire, 1970). These recursive cycles or spirals of investigation, dialogue, and reflection/action lead to the practice of *education as freedom* as students become increasingly agentic in their learning:

> Students, as they are increasingly posed with problems relating to themselves in the world and with the world, will feel increasingly challenged and obliged to respond to that challenge…their response to the challenge evokes new challenges,

followed by new understandings; and gradually the students come to regard themselves as committed (p. 57).

Culturally and linguistically responsive teaching. Dominant forms of schooling demand that students possess a particular kind of cultural capital to access school knowledge (Bourdieu, 1973). Students who do not fit the American "norm"—e.g., students of color, English language learners (ELLs), and students who live in poverty—have historically not fared as well in school as their white, native English-speaking, affluent peers (Villegas & Lucas, 2002). Such disparity in academic achievement is widely referred to as the "achievement gap" (Rothstein, 2004). In the past three decades, shifting demographics in the United States have led to increasing enrollments of students from culturally and linguistically backgrounds in elementary and secondary schools (Lucas, 2011), resulting in what some call a "demographic imperative" to improve the educational quality provided diverse students (Banks, Cochran-Smith, Moll, Richert, Zeichner, LaPage, Darling-Hammond, & McDonald, 2005). To address educational disparities—that is, to provide all students equitable access to a quality education—many researchers have advocated for preparing all teachers to provide instruction that is responsive to the multi-faceted cultural, linguistic, social, and academic needs of students, while also pursuing a curriculum relevant to their lives (Cochran-Smith, 2004; Villegas & Lucas, 2007; Ladson-Billings, 1995).

Culturally responsive/relevant teaching has grown out of critiques of education as being "one-size fits all" and categorizing all racial/ethnic groups under one umbrella, "other" (Tate & Ladson-Billings, 1995; Nieto, 2000), as well as theories stemming from

anthropology regarding "cultural mismatch" between home and school (Villegas, 1988). Culturally responsive teaching aims to increase the academic success of non-mainstream cultural groups by teaching "*to and through* their personal strengths, their intellectual capabilities, and their prior accomplishments" (Gay, 2000, p. 24). Teachers who pursue cultural responsiveness, in other words, work to close the gap between students' home cultures and the culture of schooling by tapping into their students' lives. To do so, Villegas (1991) notes, "[T]eachers must gain knowledge of the cultures represented in their classrooms, then translate this knowledge into instructional practice" (p. 13). Examples of culturally responsive/relevant practice include the infusing of multiple perspectives into the curriculum, engaging parents in the classroom, and utilizing the cultural resources of students to make connections to content (Villegas & Lucas, 2002/2007; Ladson-Billings, 1995).

Linguistically responsive teaching (Lucas, 2011) is grounded in the theory of cultural capital (Bourdieu, 1973) and the socio-linguistic perspective (Vygotsky, 1978; Norton, 2001). As previously discussed, cultural capital refers to cultural resources valued within a particular context (Bourdieu, 1973). In the school setting, academic language is a form of cultural capital. Because academic language conforms to the standards of white, middle class English, students who come from working class or non-English backgrounds must be supported in their acquiring of it (Schleppegrell, 2004). To assist their students in learning the language of schooling, teachers must be aware of the linguistic demands of classroom assignments and be able to provide explicit and

appropriate scaffolds to apprentice them into the uses of generally academic and discipline specific language (Lucas & Villegas, 2011; Walqui, 2006).

Because language serves as a tool by which we make meaning, language and learning are inseparable. Moreover, as with all learning, students build language skills through scaffolded interaction just beyond their current capabilities in the zone of proximal development (Vygotsky, 1978). As such, authentic interactions, such as speaking and participating in class activities with native speakers, are essential for ELLs and other students building academic language skills. Teachers can support language learning by building authentic social activities into their instruction (Gibbons, 2002) and ensuring that the classroom is inclusive of all learners (Lucas, Villegas, & Freedson-Gonzalez, 2008). Valuing the native language (L1) to both foster positive identity and help students transfer skills they may have already learned in their L1 (Cummins, 2000) is also essential.

An important piece of culturally and linguistically responsive teaching involves getting to know students, their families, and communities, and purposefully building relationships with them (Cochran-Smith, 2004; Delpit, 1988; Ladson-Billings, 1994; Villegas & Lucas, 2002). To help their students make connections between their home cultures and languages and those of schooling, teachers must have an understanding about different facets of their students' lives—their family, social, and community lives; their past experiences with school, teachers, and particular subjects; and how each of these aspects may have shaped beliefs about the importance of school and learning (Villegas & Lucas, 2007).

Connected to inquiring into students' lives is the development of personal relationships with them. Some researchers (e.g., Delpit, 1995) even posit that teaching marginalized populations should begin with relationship-building, rather than content instruction, as personal connections in the classroom tend to influence or motivate such students more than academic achievement in and of itself (Delpit, 1995/2006). In particular, fostering productive connections with students who are non-mainstream or non-native English speakers may help mediate the effects of the affective filter—a "mental block" that language learners may experience when they are uncomfortable, anxious, or unmotivated (Krashen, 1982, p. 22). Additionally, because the cultural capital students from non-mainstream backgrounds bring to school tends to be devalued, developing personal relationships with students can help them build a positive self-image and mediate the mismatch they may feel between their home and school lives. As Villegas and Lucas (2002) note, "The interest of teachers who take the time to know about students from oppressed groups can provide some connectedness to school that they may not feel" (p. 80).

Bringing critical perspectives to the classroom. Equity-minded teachers also develop critical perspectives about the world and the institution of schooling, which inform and drive their instruction. By "critical perspectives," I mean both a mindset of questioning assumptions about dominant culture, ideology, and institutional structures, as well as an understanding of the role of schooling in reproducing societal inequalities (Bourdieu, 1973; Freire, 1970; Cochran-Smith, 2004; Giroux, 2002; Hinchey, 2000; Villegas & Lucas, 2002). Without such awareness, teachers may accept societal

inequalities and the norms of school at face value, blind to underlying political agendas and the exclusionary or inferior qualities of urban education. In some ways, then, critical perspectives are both a precursor to, and underlying component of, the vision of equitable education discussed in this section. Below, I discuss the teacher development of socio-cultural consciousness and applying this awareness by teaching the language and norms of power and explicitly infusing social justice into the curriculum.

Socio-cultural consciousness. Approaching teaching from a constructivist epistemological viewpoint requires awareness that the way one sees the world is very much determined by background experiences and shaped by multiple factors such as class, race, and language (Hinchey, 2000; Villegas & Lucas, 2002). Thus, teachers and their students may have very different views of "reality." Another facet of socio-cultural consciousness involves understanding how inequalities are maintained and expanded among non-mainstream groups in U.S. society and the part the institution of schooling plays in that process. As teachers become aware that the institution of school does not operate on merit, but rather offers differential educational opportunities based on social class and rewards those who are conversant with the language and behavior of the dominant culture (Bourdieu, 1973; Delpit, 1995; Villegas & Lucas, 2002), they can begin to help their students gain access to education that is often denied to them. One strategy for doing so, explicitly teaching the language and norms of power, is discussed next.

Teaching the culture of power. Understanding teaching as a political act is a key understanding in bringing a critical perspective to the classroom (Cochran-Smith, 2004). Part of this understanding involves the awareness that norms of school structure,

discourse, and curriculum all serve particular political agendas—one of which is maintaining the status quo of the social hierarchy of the United States. Although teachers have little ability to mediate some aspects of schools' reproduction of inequalities, such as tracking mechanisms, teachers *can* interrupt others. Specifically, teachers have the ability to potentially affect the perpetuation of their students' exclusion from the culture of power by explicitly teaching "codes or rules" for participating in it (Delpit, 2006, p. 24). While not advocating for students to assimilate to the dominant culture, explicitly teaching different aspects of cultural capital valued by school provides students with valuable tools to access learning. To become conversant with the culture of power in school, students need direct support for learning valued ways of acting, speaking, and thinking in this context. Such support might mean examining one's lesson for implicit assumptions about what prior knowledge students might have, and ensuring that students who may not come with this tacit information are supported (Delpit, 2006). Similarly, teachers might provide students with metacognitive strategies for learning academic English (Schleppegrell, 2004; Walqui & Van Lier, 2010).

Infusing social justice into the curriculum. To provide opportunities for students to problematize their world and the inequities existing in it, teachers have a responsibility to make space in their curriculum for investigation of issues of social justice (Ayers, Hunt, & Quinn, 1998; Cochran-Smith, 2004; Freire, 1970; Grant, 2012). Exploring such topics and engaging in critical dialogue about them can help students themselves develop consciousness about inequalities and probe ideas about the contribution of social and institutional structures to historical and current oppressions (Freire, 1970). This

investigation and dialogue should not only help marginalized students become more reflective about societal injustices, but also to "talk back to the world" and become agents of change in their own lives (Au, Bigelow, & Karp, 2007, p. xi). Such critical teaching practice might involve students critiquing the relevance of their curriculum (Schultz, 2008) or investigating and analyzing relevant issues from their personal lives or community (Grant, 2012). Alongside providing opportunities to critically question, explore, and act upon issues of social justice, an equity-minded teacher should also model activism (Cochran-Smith, 2004) or change agency (Achinstein, Ogawa, & Speiglman, 2011; Villegas & Lucas, 2002) for her students.

Complexities of enacting equity-minded practice. The pedagogy discussed above and its various incarnations are not new. Many schools of teacher education advocate for educational philosophies and pedagogies consistent with this type of practice (e.g., Cochran Smith, 2004; Gay, 2000; Ladson-Billings, 1995; Nieto, 2000; Sleeter & Grant, 2006; Villegas, 2007; Villegas & Lucas, 2002; Zeichner, 2009) and an enormous body of literature exists extolling the various merits of an approach for increasing equity in education and thereby reducing inequalities in our society. Even some current policy reforms contain components that echo aspects of equity-informed pedagogies, such as learning for deeper meaning in mathematics and science, an emphasis on real-world activities, and a commitment to provide universal access to quality education (Kennedy, 2005). Despite all this, the dominant pedagogical model in urban schools remains the teacher-centered banking model (Haberman, 1995/2010; Solomon, Singer, Campbell, & Allan, 2011).

Given the evidence that the banking model of education does not match how students learn, reinforces the dominant ideologies that perpetuate societal inequalities, denies education to students possessing cultural capital differing from that of the dominant power group, and promotes positivist thinking, how can we explain the persistence of traditional educational practices? If constructivism is the dominant learning theory taught to our prospective teachers in their preparation programs, why do they not carry it out? Researchers have uncovered multiple factors and conditions that contribute to these circumstances. For one, schools themselves are undemocratic places, with rules and structures that the teacher often has little or no control over (Britzman, 1991; Darling-Hammond, 1997). In our current neoliberal educational climate, schools have become even more stratified, with increasing focus on standardizing curriculum, testing, and accountability, all of which promote more traditional notions of teaching and learning (Solomon, Singer, Campbell, & Allan, 2011; Thomas, 2013). Additionally, studies of teacher practice tell us that practice grounded in constructivism is more difficult to enact (Kosnik, Beck, & Rowsell, 2007), teachers are subject to pressure from administrators and colleagues to teach in more traditional ways (Chubbock, Clift, Allard, & Quinlan, 2001; Saka & Southerland, 2009), and students themselves often resist innovative learning (Cohen, 1988). While theories of social justice in education provide an excellent frame for understanding how inequalities are built into and perpetrated at the macro-level of schooling (the larger school-, district-, and broader institutional/society-wide levels) and offer possibilities for envisioning more equitable teaching practices, rhizomatics (Deleuze & Guattari, 1987) provides a helpful tool for explaining the

complexities of enacting change at the micro-level of the teacher and classroom. That is, rhizomatics contributes an alternate way of thinking about teaching and the complexities of enacting teaching for social justice on a day-to-day basis that breaks with the customary linear/causal perspective that prevails in education, as I explain next.

Rhizomatics

Rhizomatics is an outgrowth of work by Deleuze, a philosopher, and Guattari, a psychoanalyst, who use the concept of a rhizome to express a non-linear, multiplistic, relational model of thinking (Deleuze & Guattari, 1987). The idea of the rhizome has been taken up and expanded into both theory and methodology by poststructural philosophers and qualitative researchers who believe that "working with Deleuzo-Guattarian imaginaries opens (to) a multiplicity of possibilities for thinking differently" (Sellers, 2010, p. 557). Scientifically speaking, a rhizome is a tuber, a root that consists of a network of connections that grows unpredictably in all directions, constantly evolving. Philosophically, the rhizome is a figuration of knowledge that serves as a "multiplistic" alternative to the traditional dichotomous and linear Western mode of thought. Deleuze and Guattari (1987) explain: "Nature doesn't work that way: in nature, roots are taproots with a more multiple, lateral, and circular system of ramification, rather than a dichotomous one" (p. 5). The rhizome has several characteristics that merit attention. Each point on the rhizome must be connected to another, but not necessarily the same one; rhizomes are comprised of networks of lines that extend in all directions, forming "multiplicities"; ruptures may occur within the rhizome, but new lines will be generated; and given the temporal nature of rhizomes, they are considered maps rather

than tracings—meaning that their constantly changing structure requires an equally open representation (Ibid).

Rhizomatics offers several parallels to an educational social justice paradigm. Deleuze and Guattari (1983/1987) intended rhizomatics as a radical critique of Western thought—the same conventional knowledge structures that, researchers operating from a social justice perspective argue, stratify access to cultural and social capital. "Tree-like" or arborescent thinking processes also underline teaching through transmission. In this method, teaching means to transfer knowledge to students in the form of discrete bits of information, and learning means that students repeat those bits of information. This process mimics the "tracing" that Deleuze and Guattari mention, one that involves mere repetition rather than true growth.

While there are some similarities between rhizomatics and social justice, Deleuze and Guattari do not advocate for a revolutionary approach to social change, as many critical pedagogues might. Though they posit the rhizome as an "alternative" to the dichotomous tree, they insist that such tree-like didactic thought and power structures (which they refer to as "molar lines"), are given in society—freedom and oppression are each implicated in the other, not opposite poles. Deleuzo-Guattarian philosophy provides a theory of social change operating not as a binary opposition between total tyranny and complete anarchic rebellion, but rather as "microagressions" that gradually change a system over time (Ibid). For this study, I appropriate Deleuze and Guattari's theory of rhizomatics, read through a larger frame of social justice in education, and extend it to the positivistic conception of teaching based on principles of a capitalistic economy—also

known as neoliberalism—that dominates our schools, policy, and educational research. Deleuze and Guattari's concern with actions at the micro-level of society parallel my concern with the enactment of social-justice focused practice in the classroom. To help inform alternate ways of thinking about teaching and teaching differently at this micro-level, I have "plugged in" specific Deleuzian concepts, which I discuss in the following section.

The language of rhizomatics. Rhizomatics departs radically from the positivist, process-product notions of teaching that still tend to characterize educational research (St. Pierre, 2011). Deleuze argued that merely creating concepts that push beyond positivism was not enough—a new, transgressive language itself was needed to truly depart from a reductionist model (St. Pierre, 2004). While this idea has merit, we must also consider that "All language choices come with cost" (Ellingson, 2009, p. 149). The language Deleuze uses may be the biggest impediment to proliferation of rhizomatics as a useful frame for teaching or other non-linear social phenomena. Deleuze invented terms and concepts with every new piece of writing, amassing a vocabulary wholly his own and of such breadth that my well-thumbed copy of *The Deleuze Dictionary* was a constant companion to help me translate my Deleuzian readings during my first few months of research. While the argument for a language that breaks from the stratified boundaries of our positivistic vernacular certainly is seductive to those who seek new ways of thinking and talking about social activity, if only a narrow swathe of the scholarly community can interpret the research using the frame, the theory is rendered useless in the larger context of the educational research agenda.

In a sense, that the thickness, the density, of Deleuzian language denies access to the mainstream educational research community is supremely ironic, because the theory itself is entirely pragmatic and lends itself naturally to the study of teaching. Seminal Deleuzian questions are fundamentally concerned with practicality, process, and context: "Does it work, and how does it work? How does it work for you?" (Deleuze, 1995, p. 7). To this practical, contextual end, Deleuze encouraged readers to engage with his work in the same manner as watching TV, taking concepts that "worked" for them and "plugging" them in to their own research (St. Pierre, 2004). "Plugging in," in the Deleuzian sense, means appropriating concepts and using them in a particular context for a particular function. Although many concepts in Deleuzian philosophy merit attention, here I am plugging in only those concepts that helped me re-conceptualize or think differently—or in more complex ways—about beginning teaching. I present these in the hopes that by keeping the new terminology to a minimum, these concepts can become "lines of flight," or breaks from the status quo, that might make a broader impact. These terms are explained in detail next.

Assemblage. Assemblages are collectives, multiplicities, or "complex constellations of objects, bodies, expressions, qualities, and territories that come together for varying periods of time to ideally create new ways of functioning" (Livesey, 2005, p. 18). In other words, assemblages are heterogeneous networks that combine to *do something* together. The term assemblage is derived from the French *agencement,* which literally translates to "collective agency" (Ibid). Thus, "assemblage" does not just refer to the heterogeneous elements that compose it at a given moment, but also the processes and

ways that the composition of bodies, forces, and objects connects, organizes and fits together to produce something different through generative processes (Van Wezemael, 2008). An assemblage is an open system, simultaneously influencing and influenced by the outside, which adds to the suffusion of instability and change that characterizes it (Marcus & Saka, 2006). Extending the concept to the classroom, Defreitas (2012) describes various aspects of a rhizomatic classroom assemblage:

> The classroom assemblage is composed of humans, writing implements, writing surfaces, texts, desks, doors, as well as disciplinary forces whose power and agency are elicited through various routines (singing the anthem) and references ('In algebra, we always do this . . .'). (p. 562)

These bodies, objects, and forces come together to produce particular activities in the classroom, shaping what the teacher and students are able to collectively do.

I contend that *assemblage* is an important concept with which we can think differently about teaching. Rather than thinking of the various components of the classroom (e.g., the teacher, the students, the content, and so on) as separate, discrete, and neutral, we can consider them working together in collective agency to carry out a particular function (Defreitas, 2012). Likewise, instead of conceptualizing the teacher as a completely autonomous, agentic being with control over her teaching practice—able to automatically transfer learning to her new classroom settings—the teacher could be considered one component of a *teaching-assemblage* with various heterogenous elements comprising it at any given moment, constructing practice as collective agency, as a co-constructed process of bricolage. In other words, the multiple elements of the teaching

assemblage jointly contribute to the construction of teaching practice. Rather than discussing learning and practice as an object, something the teachers take (or are expected to take) from the university, whole, and implement in their classrooms, the concept of the teaching-assemblage can also help us complexify our thinking about the process of praxis. I theorize that instead of a linear, process-product transaction, teaching practice is constructed through ongoing negotiations between the teacher and her students and their desires and affects; the school environment, culture, and various enabling and constraining conditions; the content; the physical objects and environment of the classroom; and the teacher's own beliefs, desires and hopes about teaching, her preservice learning, and own history/positionality.

Becoming. Within a rhizomatic frame, teaching practice is not a static thing the teacher does, but rather co-constructed *becomings*, or transformations-in-action, produced by the collective workings of the teaching-assemblage. A becoming is "a verb with a consistency all its own" (Deleuze & Guattari, 1987, p. 239) referring to changes that occur within an assemblage as heterogenous elements connect (Semetsky, 2008). Becoming might be likened to the complexity science term "emergence," a production of something different by way of interactions within a system (a "system" in complexity terms is similar to a Deleuzian assemblage) (Morrison, 2008). Because becomings are created through alliances—that is, through connections with other bodies, ideas, forces, and/or objects in an assemblage—this concept presupposes the notion of being, the rational concept of a thing existing in and of itself. Becomings "express an event rather than an essence" (Deleuze, 1995, p. 25). The Deleuzian focus is always on process rather

than product because there is no end point and no conclusion, only a middle. Thus attending to process is a practicality because the product never *is*—it is always in a perpetual state of becoming, and accordingly, is never the same from moment to moment.

Although the term *becoming* appears in other theoretical and empirical work on teaching (e.g., Britzman, 1991; Freire, 1998; Greene, 1988), Deleuze and Guattari's use of this concept differs slightly. For example, Britzman (1991) commented, "Learning to teach—like teaching itself—is always the process of becoming: a time of formation and transformation, of scrutiny into what one is doing, and who one can become" (p. 8). While both uses are helpful for understanding teaching practice as a process, Deleuze and Guattari (1987) are deliberate in noting that their use of *becoming* is situated in a permanent middle, and is not a process of directional development necessarily, but *becoming-other,* becoming-different. Rather than connoting an evolution toward an end point, this use of becoming is "involution," (p. 238), a creative function occurring between heterogenous elements. Extending this concept to the classroom, *becoming-teacher* necessarily implicates not just the individual teacher, but all the elements, forces, bodies and ideas that make up the teaching-assemblage.

Becoming also helps to reframe identity in a way that expresses its dynamic nature. As other researchers in education have pointed out, teacher identity is an important consideration because of its impact on the work that occurs in the classroom (Achinstein & Ogawa, 2011; Britzman, 1991; Bullough, 2005; Lasky, 2005; Sloan, 2006). Contemporary research in education also recognizes the contextually constructed, multi-faceted, ever-shifting nature of teacher identity (Rogers & Scott, 2008; Zembylas, 2003).

Rhizomatics shifts this poststructural notion of relational and fragmented self toward a relational and fragmented *becoming-self* process, an individuality that is an event rather than a being (Deleuze, 1990). In other words, this notion moves away from the "what" question of teacher identity and toward the "how and why" of identity formation—a look at identity-in-action. In the classroom, conceptualizing a teacher identity formation *process* enables us to focus on what teachers do and are capable of doing in their assemblage, rather than what their identities are. Attending to the developmental aspect of identity allows us to move away from the idea of a teacher as a stable, encapsulated body and instead toward an amalgam of "body-world-process" (Blackman, 2012). This perspective, then, opens the possibilities of understanding the relational, contextual, and collective processes that contribute to *becoming-teacher*. I suggest in this study that *becoming-teacher* is a concept that provides an alternative to traditional notions of teacher learning and growth, an ongoing view of development that is non-linear, non-directional, and never quite actualized.

Rhizomatic lines. Rhizomatics offers a compelling theory of social change that provides possibilities for theorizing the day-to-day actions of the teacher at the micro-level of the classroom in relation to a larger agenda of *teaching differently* from the status quo of transmission instruction. Theorizing that our existence within a control state is a given, Deleuze and Guattari (1987) contend that such a state is characterized by stratification and "segments," or binaries—rules and norms imposed by higher powers at the institutional or societal macro-level that maintain the status quo. They refer to this segmented overcoding as "molar lines" (p. 213), which create boundaries that social

actors must navigate. However, these macro-level molar lines must be translated into day-to-day action in different micro-level milieus (such as the classroom), and therefore a level of *micropower* exists (Foucault, 1976)—the state and its various institutions rely on the masses to carry out societal norms, rules, and other molar lines on a daily basis (Crane & Slack, 2003). The manifestation of the molar at the micro-level, or the day-to-day enactment of the edicts of the state or institution, are known as *molecular lines*, which are the "supple fabric without which [the state's] rigid segments would not hold" (Deleuze & Guattari, 1987, p. 213). Because these molecular lines are malleable and flexible, there is always room for creative response, a break from the norm, a refusal to do what is expected or ordered. Deleuze and Guattari explain these breaks from the status quo as *lines of flight.* These three types of lines—molar and molecular lines and lines of flight—make up the rhizome.

Deleuze and Guattari contend that lines of flight drive the changes that occur in society, explaining:

> It is as if a line of flight, perhaps only a tiny trickle to begin with, leaked between segments, escaping their centralization, eluding their totalization. The profound movements stirring a society present themselves in this fashion… From the viewpoint of micropolitics, a society is defined by its lines of flight. (p. 216)

The recapturing of the line of flight is unavoidable—the regulatory functions of the state or institution, whether implicit or explicit, without or within (as we too contain molar lines), seek to control that which escapes. Because escapes from the molar are inevitably recaptured, lines of flight are always temporal (Ibid). However, in the return to the molar

status quo, the recaptured line of flight shuffles and stirs the rigid segments of the molar, perhaps in the smallest way, thereby contributing to overall change. This is the crux of Deleuze's theory of the work of the socius: social change happens over time as lines of flight occur, returning to the molar to reshuffle the system (Ibid). From a rhizomatic perspective, these lines do not necessarily represent *positive* change, however. Lines of flight may be more accurately characterized as some sort of mutation that can be "both productive and dangerous" (Albrecht-Crane & Slack, 2003).

In extending the concept of rhizomatic social change to examine classroom life, we can understand the work of the teacher in relation to a larger agenda of shifting the status quo of instruction to more equitable iterations. The work of the teacher is shaped by structures and rules, or the "grammar of schooling" (Tyack & Cuban, 1994), which impose molar lines such as the schedule of the day, the separation of knowledge and ideas into subjects, the assignment of classes, and so forth. Other molar lines are not as obvious, but still stratify the teacher's existence, such as traditional behavioral expectations of students (that they should be quiet, obedient, and in their seats) or conventional expectations of teachers (that they should separate their personal lives from the classroom, be in control of their students at all times, be stern and authoritative). Although the teacher exists within this larger stratified space defined by molar lines, her work on a day-to-day basis is *molecular*—supple and flexible, able to either reinforce the molar status quo or find momentary lines of flight that escape the molar overcoding (the various structures of schooling) (Crane & Slack, 2003; Roy, 2003). Perhaps in a candid discussion about an upcoming standardized test, the teacher and students form an alliance

that momentarily, temporarily transcends the binary of teacher-student; or a student asks an unexpected question and the class goes veering off in an unanticipated direction that opens new possibilities. These are examples of lines of flight that represent ruptures of the status quo of traditional patterns of schooling.

These lines will be recaptured—the teacher will eventually have to give the test and the students will have to take it. The bell will ring, and the students will need to move on to their next class. This is the return to the molar line. However, in that previous moment of rupture, the students and the teacher were changed infinitesimally, and upon the return to the system, a shuffling occurred that could have unforeseen repercussions at a later moment in time. But it also means that any change enacted in the classroom, any line of flight, is fleeting, and for any sustainable change to occur the teacher must continually reconstruct these lines of flight in her practice (together with her students). This perspective also has implications for understanding the work of constructing teacher practice, especially in relation to the problem of how preservice learning moves from the university to the classroom. The concept of the rhizome and its molar and molecular lines can help us understand that it is a given that the teacher must work within a constrained environment. Rather than holding an unrealistic expectation that the teacher will be able to achieve the same vision of practice she was taught at the university, and judging her to have failed when she cannot faithfully enact the decontextualized vision of practice, we might instead focus on the lines of flight, the places where the teacher *is* able to break from the status quo, to teach in more equitable ways.

Teaching as rhizomatic activity. The figuration of the rhizome is particularly well suited to the research of teaching as complex and contextually situated phenomena (Defreitas, 2012; Roy, 2003), a description that researchers today generally agree upon (e.g., Ball, 1997; Borko & Putnam, 1997; Britzman, 1991; Cochran Smith & Lytle 1993; Grossman, Hammerness, & McDonald, 2009; Lave & Wenger, 1991; Wideen, Mayer-Smith, & Moon, 1998). In the past two decades, researchers who take the perspective that teaching and learning are not linear processes have contributed much to an understanding of education through in-depth, qualitative studies that approach teaching, and learning to teach, within naturalistic settings. While this line of research has certainly demonstrated that "context matters," those who acknowledge educational complexity tend to use the term more as a critique of the often simplistic characterization of teaching (Grossman, Hammerness, & McDonald, 2009) than as a framework to "fully account for the unanticipated and unpredictable nature of teaching and learning" (Clarke & Collins, 2007, p. 162). By adopting rhizomatics as a conceptual tool to complement my overarching frame of social justice, I hope to extend the ideas articulated by previous work on first-year teaching practice by considering the teacher as working collectively within a heterogenous assemblage of various forces, affects, bodies, ideas, and objects, to negotiate and construct practice within a larger stratified environment. In doing so, I aim to illuminate the "why" and "how" of processes of first-year teaching practice, which can in turn inform the education and continuing support of new teachers prepared to "teach differently."

In the past decade, policy reforms aimed at school accountability have tended to

take a one-dimensional, input-output view of education. Johnson (2008) notes,

> …the simple linear algorithm implicit in current policy such as the Adequate Yearly Progress provision of No Child Left Behind (U.S. Department of Education, 2002) fails to take into account the complex and dynamic nature of education and represents an inappropriate oversimplification of educational outcomes and their measurement. (p. 1)

Even more recent reforms aim to hold the teacher accountable for her performance by tying her evaluation to her students' test scores (Braun, 2005). Such reforms reinforce the view of the teacher an autonomous actor with absolute agency. This is further supported by a wider societal focus on the individual, reinforced by western capitalistic ideology (Battram, 1998; Deleuze & Guattari, 1987). However, a teacher is not isolated and apart from the world—she is subject to influences from any combination of elements in her context. But neither is the teacher completely a victim of her environment, her practices mere responses to stimuli from the outside. Teachers not only *shape* their work, but they are also *shaped by* their work and their context (Britzman, 1991). Thus, teaching practice is not necessarily something a teacher *does* as a result of one thing, be it her pre-professional education, her own professional and personal goals, or her classroom environment. Rather, teaching practice is created as a product of ongoing interactions between the teacher and the conflux of elements that come together in unpredictable ways in the classroom to function in different ways—in other words, the *teaching-assemblage.*

Rhizomatics, read through a lens of social justice in education, offers a different way of conceptualizing the work of teaching: not as the sole work of the teacher, who serves as active agent controlling the environment and learning, but rather as a set of ongoing negotiations that occur between bodies and forces on a moment-to- moment basis—in other words, rhizomatic activity. Honan (2004) offers a compelling description as the teacher as *bricoleur,* weaving together her practice from the materials she has available and within the constraints of the environment to create a patchwork quilt of teaching practice. While this view adds a layer of complexity to understanding the enactment of teaching practice in context, it still continues to position the teacher as an autonomous actor. A more fruitful descriptor may be to think of the teacher as a *co-bricoleur,* whose work might be, for example, to create a framework of a lesson within which she negotiates with the students, the structural constraints and other school elements, her immediate environment, the content, and so on, to co-construct practice. I contend that rhizomatics offers concepts that are helpful for theorizing this work on a daily basis, as well as maintaining an overall frame of non-linearity and contextually-situated construction of practice.

Literature Review

The literature regarding first-year teaching practice suggests that beginning educators tend to maintain the status quo of teaching that characterizes our urban educational system. Multiple factors and conditions contribute to this pattern. Because of the difference in their new settings (Roy, 2003), first-year teachers tend to experience major disequilibrium (Chubbock, 2008; Huberman, 1989; Veenman 1984), which

increases in severity with constraining environmental conditions such as isolating school cultures (Stanulis, Fallona & Pearson, 2002), challenging class assignments (Farrell, 2003; Hargreaves & Jacka, 1995; Tait, 2008;), and unsupportive administrators (Scherff, 2008). Teachers mainly remain disconnected and isolated in schools, and multiple factors contribute to the reinforcement of traditional education philosophies, resulting in the overall maintenance of practices that are mainly consistent with those observed in classrooms for the last century. Although the literature regarding first-year teachers generally shows that the traditional nature of teaching is maintained over time as a whole (Allebone, 2006; Allen, 2009; Brashier & Norris, 2007; Chubbock, et al. 2001; Hargreaves & Jacka, 1995; Luft & Roehrig, 2005; Massengill, Mahlios, & Barry, 2005; Saka, Southerland, & Brooks; Stanulis, Fallona, & Pearson, 2002), pockets of unpredictability also exist regarding how the teacher, her environment, and the work of teaching might interact and respond to each other. This micro-level classroom activity indicates the possibility for lines of flight that may contribute to the construction of teaching practices that are more consistent with equity-minded pedagogies.

The review that follows provides an overview of the above-noted factors and conditions shaping first-year teaching practice. While the focus of the current study is on the teacher and teaching-assemblage, the majority of the empirical works regarding first-year teacher development address the larger school environment, especially interactions between the teacher, her colleagues, and her school structures. This tendency in the research is reflected in the review, which includes studies addressing both the classroom and school contexts. Moreover, my research takes place in urban schools, but the relative

dearth of studies researching first-year teachers specifically in urban settings precluded this narrowing of focus in the following review. These findings further support the need to theorize the day-to-day workings of first-year teachers' classrooms in urban settings.

Difference and Disequilibrium

As beginning teachers move into their classrooms, the profusion of difference from what is expected based on visions of ideal practice provided in the university results in feelings of disequilibrium when their new settings and work clash with their preconceived notions and preservice experiences (Roy, 2003). This disequilibrium spans the reality shock of actual classroom conditions (Bianchini & Cazavos, 2007; Chubbock, 2008; Farrell, 2003; Hargreaves & Jacka, 1995), to a cultural mismatch with students (Bergeron, 2008; Birrell, 1995) to the difficulties of transferring preservice learning (Beck, Kosnik, & Rowsell, 2007; Massengill, Mahlios, & Barry, 2005; Luft & Roehrig, 2005), to the misalignment between the innovative pedagogy taught in universities and the more traditional methods seemingly entrenched in many schools (Allen, 2009; Ferguson-Patrick, 2011; McDonough, 2009; McElhone et al. 2009; Newman, 2010). Cultures characterized by isolation and individualism (Chubbock et al. 2001; Eldar et al, 2003; Farrell, 2003; Hargreaves & Jacka, 1995; Hebert & Worthy, 2001; Stanulis, Fallona, & Pearson, 2002), lack of guidance or support (Fry, 2007; Hargreaves & Jacka, 1995; He & Cooper, 2011; Hebert & Worthy, 2001; Scherff, 2008), extremely challenging classroom assignments (Romano, 2008; Stanulis, Fallona, & Pearson, 2002; Starkey, 2010; Tait, 2008), and personal characteristics of the teacher such as the level of confidence in her ability (Carter, et al. 1988; Chubbock et al. 2001; Eldar, et al., 2003;

Lambson, 2010; Luft & Roehrig, 2005; Scherff, 2008; Starkey, 2010) can interact and combine with these issues to culminate in disequilibrium so great that new teachers chose to move to different schools or to leave the profession altogether.

Birrell's (1995) case study of a white first-year teacher in a predominantly African-American school provides an interesting example of disequilibrium triggered by the interactions of factors such as cultural mismatch between the teacher and students, the teacher's beliefs about teaching, disruptive student behavior, and an isolating school culture. The new teacher, who had been raised in a homogenous middle class area of the mid-west, struggled to deal with unfamiliar cultural norms of his students and what he perceived as their lack of value of education: "Black kids hit me with their lingo and I hate it. I try to get them to be quiet and do their work, and all I hear is 'Yo man, I'm not going to do this work and you're not going to make me'" (p. 140). Isolated and left to his own devices, the teacher adopted classroom management strategies he remembered from his own educational experience in a mostly-white school, which did not resonate with his students and only brought about further resistance from them. Finally, the teacher requested a transfer to a school where the students had assimilated to mainstream white culture. At his new school, the teacher commented, "These are my kind of people, and I don't feel like an outsider any more…I like the black kids here, most of them act white, and they do their schoolwork" (p. 141).

The Multiple Influences and Interactions of Teaching Practice

Many factors, including the first-year teacher herself, her environment, and the work of teaching—the teaching-assemblage—combine and work together to shape

teaching practice. To this process, the teacher brings her history and background experiences (Birrell, 1995; Hargreaves & Jacka, 1995), personal qualities (Hebert & Worthy, 2001; Tait, 2008), preservice learning (Beck, Kosnik, & Rowsell, 2007; Towers, 2010), beliefs (Bergeron, 2008; Grossman & Thompson, 2008) and needs (Brashier & Norris, 2008; Chubbock, 2008; Cook, 2009; Farrell, 2003; Massengill, Mahlios, & Barry, 2005; Stanulis, Fallona, & Pearson, 2002), all of which help shape her work. For example, Starkey's (2010) study provides a striking example of how teachers' deep-seated beliefs about teaching and learning can influence instructional decisions. Using a multiple case study design and a complexity framework, Starkey examined the extent to which six high school teachers in New Zealand integrated technology into their instruction. While many factors were found to influence the teachers' technological integration, one particular example serves to illustrate the potential for traditional beliefs about pedagogy to shape practice. One of the six teachers noted that he used technology in mathematics far less than his colleagues. Several different factors seemed to contribute to his negotiation of practice. He confessed that he was much less comfortable using technology to teach mathematics because he had much less expertise with this method, and he was not confident that he would be able to integrate technology effectively for his students. Additionally, he believed that math learning should be tactical, and students should use a pen and paper to work out problems by hand, as he himself had learned math as a young student. This belief, interacting with a lack of experience and confidence using technology in math, produced practices that underemphasized technology in this content area.

The classroom and school environment includes numerous elements with which the teacher must negotiate. Within the classroom, the teacher must interact with her students, their diverse needs, and their dynamics as a class, and these recursively influence practices. Brashier and Norris (2008), investigating the practices of 25 early-grade teachers to identify factors that affected teachers' use of certain developmentally appropriate strategies, found that several study participants reduced—but did not necessarily abandon—their use of such practices to quell conflict in their classrooms. One teacher discussed the tension between ensuring orderly conduct and maintaining developmentally appropriate practice as follows:

> I feel like this time of the day is the most fun and one of the most meaningful (as far as learning goes) parts of the day for my students, but more children get in trouble during this time too. I see tendencies to become too loud, and even too violent. My students don't hit or push much, but in centers and at recess, it tends to happen a lot. (p. 35)

Likewise, a first-year teacher studied by Hargreaves and Jacka (1995) hybridized her practice in response to classroom management struggles she experienced. The teacher expressed a deep commitment to collaboration and democratic practice in the classroom, but felt that she had to act in a more authoritarian manner to maintain order in her class and maintain her personal sense of wellbeing. The teacher commented, "I totally disagree with behavior modification, but I felt I had to do something because my classroom management wasn't working and I couldn't function that way in the classroom" (p. 52). However, even while the teacher was using behavior modification techniques,

she held class discussions regarding behavior and asked students for input in reaching a solution regarding classroom behavior norms. Though the teacher had adopted more traditional management methods, she was still attempting to give the students a voice in classroom relations, which could be considered a more democratic practice.

As another example, Stanulis, Fallona, and Pearson (2002) studied three beginning teachers who took part in a support group provided by their university. All three discussed the tension they experienced between maintaining the more progressive methods learned in their university and adopting traditional management strategies in response to their students' behavior. While reflecting about raising her voice to gain control of her students, one teacher commented, "I've had to resort to the kind of things I really don't like doing to have a better-managed classroom" (p. 76). Because new teachers are also working out their classroom identities, or their notions of teacher-self, this tension between their own beliefs and the practices produced through classroom interactions may contribute to teachers feeling that they are performing a role or adopting a particular persona (Cook, 2009). While the idea that interactions with students or school context influence the construction of teacher identity seems logical, few studies of novice practice speak to a more socio-cultural notion of the development of a teacher self. However, several works regarding preservice teacher identity feature such a perspective (e.g., Jackson, 2001; De Lima, 2003; Rogers, Marshall, & Tyson, 2006; Tang, 2002).

In the school environment, the teacher must interact with other teachers, administrators, parents, the collective school culture, and school policies and schedules, all of which have the potential for shaping teaching practice in unpredictable ways. For

instance, Scherff's (2008) comparative case study of two beginning teachers, the administration's lack of support for the teaching staff created a power imbalance that the new teacher felt interfered with his abilities to manage the classroom and assign appropriate grades. The teacher commented, "The administration makes us more like the students every day. The students can talk worse to us with no consequences… these kids know you can't do anything to them. Like if you fail a senior, there's a good chance you're gonna see lawyers" (p. 1323). The teacher blamed this situation for his classroom management struggles, and felt powerless to hold his students accountable for their behavior or their academic performance. His attitude grew more and more negative over the course of the year, and he finally decided to leave the profession.

Practice can also be shaped by non-human teaching-assemblage elements, including the various activities of teaching itself, such planning, managing classroom routines and behavior, enacting instructional activities, and reflecting on practice (Danielson, 2007). These activities do not exist apart from the teacher—they are recursively informed by teacher-elements (her history, background experiences, personal qualities, beliefs, preparation for teaching, and needs) as well as aspects of her classroom/school context. For example, the work of teaching during classroom time usually means that teachers and students are interacting with the instruction as well as each other, and the way in which students respond to their teachers' instructional decisions and other classroom actions contributes to the construction of practice.

The work of Saka, Southerland, and Brooks (2009) illustrates the potential impact of student responses to instruction on teachers' practices. The researchers used a

framework of cultural-historical activity theory (CHAT) and a comparative case study methodology to investigate the practices of two first-year science teachers who had graduated from a preservice program emphasizing inquiry-based instruction. The first teacher had expressed a commitment to both teaching through inquiry and equity at the beginning of the school year. However, after working with his challenging students, who seemed unmotivated and lacking in science content knowledge, and coming under pressure from the administration to teach in a more traditional manner, he rejected inquiry. Instead, the teacher adopted a lecture-based style that he believed met the students' needs, would also allow classroom time to address personal issues with them, and would fit the instructional expectations of the collective school community. Interestingly, rather than responding positively, students became more disruptive and disengaged. By the end of the year, the teacher had not only adopted practices that were the antithesis of the pedagogy he had learned in his preservice program, but had also become negative toward students and "came to think that some students simply could not be taught science" (p. 1011). This evidence points to the co-construction of teaching practices between the teacher, students, and other elements in the teaching assemblage, which I previously mentioned might be described as "co-bricolage" or "collective agency."

Connection and Communication

For teachers to negotiate creative and innovative teaching practice, productive connection and communication between teachers and their colleagues/administrators are critical. Generally, first-year teachers report a lack of support and collaboration, which

contributes to feelings of isolation (Andersson & Andersson, 2008; Bianchini & Cazavos, 2007; Eldar, et al, 2003; Farrell, 2003; Hargreaves & Jacka, 1995; Hebert & Worthy, 2001; Loftstrom & Eisenschmidt, 2008). However, pockets of unpredictability exist within the literature that demonstrate the possibilities of collaborative emergence. These unpredictable elements included mentor support (Hunter, et al., 2011; Newman, 2010; Saka, Southerland, & Brooks, 2009) and school-wide professional learning community initiatives (Lambson, 2010). Lambson's (2010) qualitative, interpretive case study of three first-year teachers taking part in a school-based teacher professional learning community highlights the potential of the positive impact of productive interactions between colleagues. The school at which the study took place had a long-standing and close relationship with the university as well as established school norms of participation in teacher inquiry groups. During the year-long study group led by a teacher educator from the partner university, the beginning teachers interacted with more experienced teachers at first as "peripheral participants" (Lambson, 2010, p. 1662, citing Lave & Wenger, 2001) and gradually took on more of a central role. As the year progressed, the teachers became more confident in their practices and an increasingly integral part of the teacher learning community.

From a rhizomatic perspective, increased connectivity between multiplicities and the heterogeneous elements that comprise them—such as providing opportunities for new teachers to connect with other teachers for support, promoting collaboration, and offering professional development—can contribute to productive disequilibrium, which can result in lines of flight that lead to positive development for first-year teachers. In a rhizome,

elements exist only in relation to each other, and thus connectivity becomes extremely important to survival and growth. Connectivity can also be seen as a form of communication establishing new, different relationships. In making numerous, unpredictable connections, "the assemblage is destined to produce a new reality" (Livesey, 2005 p. 18). Thus, the positive connections among colleagues reported by Lambson (2010) fostered the construction of a new reality—a supportive and collaborative community that promoted the development of first-year teacher practice.

Constraining and Enabling Conditions

The connections and communications within the school environment can enable or constrain efforts to teach equitably. In the literature regarding first-year teachers, these largely served to pressure new teachers to adopt practices that fit the traditional norm of instruction (Allen, 2009; Brashier & Norris, 2007; Chubbock, 2001; Luft & Roehrig, 2005; Saka, Southerland, & Brooks, 2009; Stanulis, Fallona & Pearson, 2002). For example, Saka, Southerland, and Brooks's (2009) study featured a beginning teacher in a school that was labeled as failing under No Child Left Behind, and as a result had adopted a culture that emphasized testing, privileged rote teaching methods, and promoted an individualistic mentality among teachers. Although the teacher initially attempted to implement inquiry-based lessons (a focus of his preservice preparation program), the combination of the school culture and his challenging student behavior contributed to his conforming to the school norm of traditional, lecture-based pedagogy. In rhizomatic terms, the combination of factors would be characterized as reinforcing

molar lines, linkages that perpetuate dominant ideologies (Deleuze & Guattari, 1987), and the molecular work of the teacher in his assemblage reinscribed these.

However, the literature does contain evidence of conditions enabling development of practices that might break from the status quo. Bergeron (2008) provides an instructive example. A white, first-year teacher, who was a graduate of a preservice program emphasizing culturally relevant instruction, taught mainly Spanish-speaking students in Arizona, which had just passed a law making it illegal to teach in an English language learner's native language. The principal's educational values were aligned with the new teacher's, and the school leader encouraged her to implement language supports and bilingual instruction. Her colleagues also provided support, and her students responded positively to her instructional efforts. The teacher responded with increased confidence and continued to take risks another novice might not have. These unexpected interactions illustrate the potential of lines of flight in daily practice to feed back into the system and amplify change in teaching practice.

Patterns of First-Year Practice

Across the first-year teaching literature, traditional practices in teaching are largely maintained, with multiple factors contributing to conditions which constrain new teachers in transferring practices learned in their preservice preparation programs (Allebone, 2006; Allen, 2009; Beck, Kosnik, & Rowsell, 2007; Bianchini & Cazavos, 2007; Brashier & Norris, 2008; Chubbock, 2008; Chubbock, et al., 2001; Fry, 2007; Hargreaves & Jacka, 1995; Hollingsworth, 1992; Massengill, Mahlios, & Barry, 2005; McElhone, Hebard, Scott, & Juel, 2009; Saka, Southerland, & Brooks, 2009; Tait, 2008;

Ulvik, Smith, & Helleve, 2009) and encourage enactment of more traditional instruction and collegial isolation. Ultimately, such trends contribute to the further striation of teaching-assemblages, constraining teachers and students from collectively escaping from the status quo. This increasing striation fans the flames of the disturbingly high attrition rate among first-year teachers and maintains traditional teaching and school organizational patterns that are not optimal for a global economy (Darling-Hammond, 2006) and even worse, maintains and expands entrenched inequalities in the educational system (Bourdieu, 1973; Lipman, 2004). In Deleuzian terms, the molar lines present in the literature translate to the classroom setting in ways that bind the molecular work of the teacher, her day-to-day work, to the status quo. This upholds conservative trends of education, contributing to a pattern that may have some local variety, but ultimately holds overall traditional transmission methods constant in classrooms.

Although traditional instruction and collegial isolation tends to be the reigning pattern that emerges from interactions between the teacher, classroom and school contexts, and the work of teaching, unpredictability exists on several levels. For example, there is considerable variability between school settings—the “difference” noted at the start of this chapter. Teachers may have different personal attributes, beliefs, or histories; students present a range of varying characteristics, needs, and dynamics; and schools can offer a dizzying array of personalities, values, and organizational structures. Further, even across contexts that may appear to be similar, such as schools in neighborhoods with comparable economic levels or classes that share cultural characteristics, students, teachers, and other assemblage elements may interact differently or produce unexpected

responses to instruction. This inherent unpredictability provides opportunities for adaptation to the local environment, which can result in new lines of flight of teaching-differently. In reviewing literature regarding first year teaching, I identified micro-level manifestations of "teaching-differently," such as collaborative learning (Ferguson-Patrick, 2011), culturally responsive teaching (Bergeron, 2009; Hollingsworth, 1992; McAlpine & Crago, 1995; McElhone et al. 2009), equitable teaching practices (Chubbock, 2008, Cook, 2009), student-centered and inquiry based teaching (Bianchini & Cazavos, 2007; Luft, 2009; Saka, Southerland, & Brooks, 2009; Towers, 2010), reflection (Chubbock et al. 2001; Hollingsworth, 1992; Kilgore, Ross, and Zbikowski, 1990; McDonough, 2009; Tait 2008), resilience strategies (Castro, Kelly & Shih, 2010; Cook, 2009; Tait, 2009), and practices that promote relationship-building with students and their families (Eldar et al. 2003; He & Cooper, 2011; Hebert & Worthy, 2001; Romano & Gibson, 2006).

In some instances, one or two unexpected or unusual teaching-assemblage elements, such as continued support from the university preservice program throughout the induction phase (Luft, 2009; Luft & Roehrig, 2005; Stanulis, Fallona, & Pearson, 2002), a strong sense of situated agency on the part of the teacher (Castro, Kelly, & Shih, 2010; Hebert & Worthy, 2001; Tait, 2008), or a school culture that valued inquiry and collaboration (Saka, Southerland & Brooks, 2009) could lead to unanticipated interactions that escaped the status quo of traditional patterns in schools. These served as lines of flight that indicate possibilities for developing progressive practice. Hebert and Worthy (2001) demonstrate this principle in their study of what they termed a case of novice success: a first-year teacher who, despite an isolationist school culture, initially

unresponsive administration, and colleagues who marginalized her due to her position as a physical education teacher, was able to become an active participant within the school and build positive relationships with staff by virtue of her own personal qualities, including a strong sense of personal agency, a positive outlook, and persistence.

The elements across studies that seemed to support teaching-differently included school partnerships (Bianchini & Cazavos, 2007; Lambson, 2010), collaborative school cultures (Saka, Southerland, & Brooks, 2009, Lambson, 2010), supportive administrators and/or colleagues (Castro, Kelly, & Shih, 2010; Bergeron, 2008; Eldar et al., 2003; Farrell, 2003; Fry, 2007), quality mentoring experiences (Hunter, et al., 2011; Newman, 2010), and induction programs provided by teachers' preservice preparation programs (Luft & Roehrig, 2005; Luft, 2009; Stanulis, Fallona, & Pearson; Ulvik, Smith, & Helleve, 2009). Although the becoming of such practices is not predictable, we as educators can pay attention to enabling structural conditions, such as the ones noted above, to inform efforts to support beginning teachers.

Information about the day-to-day processes of first year teaching practice can contribute to our research on the ways teaching knowledge and skills move from the university to the classroom, which can prove helpful for teacher educators and teacher preparation programs as they seek to prepare teachers to serve an ever-diversifying school population. Additionally, description of the process of negotiation of first-year teaching can help all educational stakeholders better understand how to support new teachers in order to increase instructional quality and improve overall retention. For understanding the day-to-day work of the teacher, in-depth qualitative studies with rich

descriptions of teaching practice are necessary. Within the first-year teaching literature, relatively few studies contain such descriptions, especially at the classroom level, or the molecular level. For this reason, as well as those noted above, I concentrate my study at this level, although with full acknowledgement that the teacher, her practice, and her classroom environment are situated within larger educational contexts.

From a teacher education perspective, one possibility to meet the challenge of better preparing beginning teachers and supporting them as they move into teaching has been to present a more ecological, "hybrid" approach to teacher preparation, one that situates the learning of teachers in the same district in which they will eventually teach with the hope that the teachers will be more familiar with the student population and organizational structures. The particular hybrid education program in question provides an integrated curriculum and yearlong practicum that seeks to bridge the divide between the university and the schools, nurtures a collaborative partnership with a large urban district, and provides intensive induction support for the first three years of teaching. But once graduates of this program begin teaching, how does their learning move across time and space? How does the teacher negotiate her learning with the constraints of her new environment? As has been demonstrated by the literature review, preservice learning is only one component in a vast network of elements that converge to inform the beginning teacher's practices. Within this teaching-assemblage of heterogeneous bodies, forces, objects, and ideas, how does her learning shape practice, if at all? In the next section, I will address the methodology that underpins the study and detail the methods that will be used to conduct the inquiry.

Chapter Three: Methodology

This study investigated the question, "Given their common experiences of preservice preparation in a hybrid urban teacher education program, how do three first-year teachers negotiate their pre-professional pedagogical learning within their new school environments as they construct their teaching practice?" To investigate teaching as complex phenomena, I brought together analytic methods combining rhizomatic mapping and elements of constructivist/postmodern grounded theory, report key findings of the study through traditional case study, and use rhizomatic concepts as an analytic lens to "think with theory" (Mazzei & Youngblood Jackson, 2012). This blending of method follows an understanding of qualitative research grounded in postmodernism and subsequent *post* perspectives (e.g., poststructuralism, postcolonialism, posthumanist, and so on), which St. Pierre (2011) has argued constitutes "post-qualitative research" (p. 613). In this section, I first position the study on the qualitative research continuum, providing an overview of the "post-qualitative"/Deleuzian perspective that undergirds my work. I then describe the case study approach, the participants, and data collection. This is followed by a summary of analytic methods, which included rhizomatic mapping (Waterhouse, 2011) and components of constructivist/postmodern grounded theory approaches (Sharmaz, 2002; Clarke, 2005), and an overview of the presentation of each case study (Merriam, 1998; Yin, 2009). Finally, I interrogate my own role and positionality in the study, followed by a discussion of the trustworthiness and limitations of this work.

Post-Qualitative Research

Qualitative methodology is well suited for exploring "why," "how" and "what" questions that seek to understand and explain, rather than to measure (Merriam, 2009). In this type of research, the focus of the inquiry is teasing out meaning, rather than emphasizing control and prediction (Lather, 1992). Qualitative methods lend themselves well to the study of complex, non-linear, contextually situated phenomena such as teaching. While qualitative research is a continuum containing many genres informed by countless perspectives (Denzin & Lincoln, 2011), I position my study toward what St. Pierre (2011) refers to as "post-qualitative research," indicating an affinity with the "post" frames noted previously. This perspective insists that all knowing is partial (Ellsworth, 1989; Richardson, 1994; St. Pierre, 2000) and research is inherently value and perspective-based (Altheide & Johnson, 2011).

Because post-qualitative methodology seeks to "open up" traditional research methods, which are based on the arborescent tree-type thinking that Deleuze and Guattari critique (St. Pierre, 2011), as well as the knowing subject that the theory of rhizomatics problematizes (St. Pierre, 2004), this methodology is consistent with the rhizomatic frame that undergirds this study. Moreover, this methodological approach is consistent with the ontological focus of rhizomatics, or its concern with material processes. From a rhizomatic perspective, an inquiry into "what is" would be useless because the world is constantly shifting and becoming different from one moment to the next. Questions supported by a post-methodological frame leave encapsulated bodies behind and instead

take up a performative approach—that is, they focus on "practices…as well as the productive effects of those practices and the conditions for their efficacy" (Barad, 2007, p. 49).

Post-qualitative researchers doubt that any one method is "right" or one body of knowledge is "true," yet do not reject more traditional qualitative methods out of hand either (Ellingson, 2009; Richardson, 1994). Rather, the idea is to "open up" more rigid academic conventions while experimenting with alternatives (St. Pierre, 2011). Although I began my research with the intention to analyze and report my data in a thoroughly non-linear manner, thereby interrupting normalized research structures, I instead found myself straddling Ellingson's (2009) articulated "middle" stance on the continuum of qualitative research (with positivist, objective research on one end and artistic/performative at the other). For my study, this meant that some conventions of traditional qualitative research, such as coding, categorizing, and pattern making, were retained to an extent. These traditional processes represented the molar lines, or the normalizing forces, of qualitative research for my particular dissertation study. While I have also sought micro-transformations that temporarily escape the status quo of qualitative methods, I present my data with the acknowledgement that I have made "agential cuts" (Barad, 2007) or decisions that shape the story which is to be told in particular ways. Thus, while I can claim some knowing or thinking from what I have generated, this knowledge or thought is only ever partial (Ibid). By situating my analytic methods in the postmodern (Clarke, 2003), I focused on the multiplistic, relational, ontological facets of complex phenomena. I contend that these small escapes from the normative conventions of the field, like

Deleuzo-Guattarian "lines of flight," hold potential for shifting the thinking in teacher education, even the smallest amount, toward a troubling of linear, causal conceptions of teaching.

Case Study

St. Pierre (2011) warns that post-qualitative methodology does not offer "a recipe, an outline, a structure…another handy 'research design' in which one can safely secure oneself and one's work" (p. 613). Thus with a grounding in the philosophical tenets of postmodern methodology, I turned to a case study method to begin structuring the actual design of the research study itself. Stake (2008) notes, "Case study is not a methodological choice, but a choice of what is to be studied" (p. 119). Because I am investigating teaching practice in classrooms, designing my study as multiple case studies (Yin, 2009) made sense, as they allow for in-depth investigation into the complicated set of institutional, political, developmental, and personal factors that shape actions in schools and classrooms (Stake, 1995). While other research genres, both qualitative and quantitative, tend to focus on isolating phenomena for further investigation, case study methods allow the researcher to gain deeper and more holistic understanding of complex phenomena, like teaching, that involve multiple interacting variables (Merriam, 1998). Miles and Huberman (1994) refer to a case as "phenomenon of some sort occurring in a bounded context," (p. 25), presenting a visual of a heart inside a circle: the phenomenon under investigation is the heart of the research, and the circle bounds the area of study.

For each of my three cases, the teacher, as the primary focus of my question, was the unit of analysis—although this became muddled as my research unfolded, because the

focus was really on the interactions that occurred between the teachers and the various elements that shaped their teaching practices. The classroom served as the boundary of each case, allowing me to conceptualize the teaching-assemblage. Additionally, while the literature regarding the teaching practices of first-year teachers is relatively thin, existing studies tend to focus on teacher activity at the school level, such as professional development or collegial interactions. Very few studies contain thick description of actual instructional practices or information regarding the how these practices are negotiated with students, which means we know little of what happens in the classrooms of first-year teachers regarding instructional interactions. That is, we know little about the molecular work, the teacher's day to day translation of the macro (such as edicts from school, district, state, or federal level) to the micro (such as the classroom), which works to uphold the status quo of traditional patterns of schooling. As Deleuze and Guattari (1987) note, to learn about social change we must pay attention to the micro level interactions of the socius, "the little imitations, oppositions, and inventions constituting an entire realm of sub-representative matter" (p. 219).

While I mainly focused on the teacher, her practices, and classroom activities and interactions with students—the micro-level activity of the classroom—the boundaries of the case are not fixed, but fluid and open. This means that not only does the exterior influence the interior, and vice versa, but that occasionally the outside actually leaks into the inside: the department chair comes in for an observation, the teacher has shared with me that an observed lesson was collaboratively planned with a colleague, the office intercom interrupts a lesson to call a student out of class, and so on. Despite this

inevitability, I focused on macro-level elements only when absolutely necessary to attempt to retain the focus on the molecular, day-to-day work of the teacher at the classroom level.

Participants

The participant group included three first-year, secondary science teachers in a large urban school district who attended the same hybrid urban teacher education program, the NUTR. I selected these teachers because it presented an opportunity to study the development of novices who were prepared in very similar schools to the ones in which they would be teaching in their first year; took part in a program that emphasized inquiry-based teaching and professional collaboration as well as deliberately sought to foster dispositions needed for urban teaching (Haberman, 1995; Villegas, 2007); and would receive intensive support through their initial three years of teaching. Given their common experience in this unique teacher preparation program, I was interested understanding how the teachers might negotiate their learning and experiences within their new contexts to construct practice. Below, I briefly describe the selection process and the participants. Because I offer a detailed description of each participant in the context of his/her setting in the exposition of each case, the descriptions offered here are cursory.

When I began to plan my study, the recently graduated cohort of the NUTR included eight teachers who might serve as potential participants. Six were prepared to teach various disciplines of secondary science and two would be teaching secondary mathematics. Because my own humanities-focused education limits my knowledge of

higher-level mathematics content, which I believed might impair my understanding of the lesson or related tasks during observations, I narrowed my pool of potential participants to the six science teachers. Of these six, three high school science teachers—Mauro, Bruce, and June (pseudonyms selected by the participants), agreed to participate in my study. As noted in the NUTR program description, I previously served as a doctoral assistant with the NUTR program, and thus I had prior relationships with all three participants. I provide further detail regarding participant relationships both later in this section and in my discussion of researcher positionality and trustworthiness.

Originally, I invited two teachers, Aaron (a pseudonym) and Mauro, who were offered positions at Lincoln High School, the same large, diverse high school in which they taught during their yearlong practicum, to take part in my study. These participants were attractive because they would be continuing as first-year teachers in the same environment, resulting in a familiarity with their placement that studies have shown can provide enabling conditions to new teachers (Hebert & Worthy, 2001; Lambson, 2010; Luft & Roehrig, 2005). Additionally, the urban hybrid education program has a definite presence in the school, which was the original site where the program began placing residents in 2010. The program also enjoys the ardent support of the principal and leadership team. Aaron was hired as a ninth grade physics and environmental science teacher, while Mauro accepted a position to teach ninth grade environmental science and eleventh grade earth science. Both teachers initially accepted my invitation, but as school started in September, Aaron was overwhelmed with his new responsibilities and

withdrew from the study. Mauro, despite having responsibility for teaching two subjects, one of which was fairly new to him, agreed to participate.

June, my second participant, had accepted a position as a tenth grade special education biology teacher at Washington High School, although it meant having to return to return to school and take evening classes to receive a dual credential for science and special education and the school's reputation for being an extremely challenging teaching environment with frequent outbreaks of violence. June was enthusiastic about taking part in my project, as she worried about being isolated in her new setting. Normally, NUTR residents were placed in cohorts of at least two, but because no other teaching positions were available, she was the only NUTR graduate in this setting. NUTR leadership had actually discouraged her from taking the position for multiple reasons: she would not have another resident with her, they thought a general education biology position would be preferable, and they worried about supporting her given the general dysfunction and school site chaos for which Washington was notorious throughout the district. Although I made clear to her that I was not a replacement for a mentor, June felt that having me there, even in a research capacity, would serve as a link to her former NUTR community and just "seeing a familiar face" would give her a feeling of security.

Bruce, whom I sought out after Aaron withdrew, was the third teacher who agreed to participate in the study. He had been hired to teach ninth grade physics at a relatively new, and growing, magnet school, Northeastern College Prep (NCP), which focused on college preparation. The small school had begun as a single sixth grade class, and grown by one grade each year, with the current ninth graders as the most senior class. I realized

that Bruce's case had the potential to be very complex, given he had struggled the previous year with both transitioning from a transmission to inquiry-based philosophy of teaching and had experienced difficulty with social perception and student relationships, problems that nearly kept him from graduating from the program. The consensus among NUTR faculty was that while Bruce had a lot of potential, he would need more intensive supports than the other graduates throughout the induction phase. However, Bruce was also enthusiastic about participating in the study, and I was relieved to have found a third participant.

I realized upfront that navigating my previous relationships with the residents, as well as the NUTR program, could be complex. I knew each of the three residents fairly well. I had been part of their initial program selection, having attended each of their interviews and interacting with each of them during the process. As the doctoral student assigned to the program, I took part in most of their classes the previous year, as well as led a social-justice focused project cycle with them. In my capacity as the primary data collector for NUTR secondary program research, I had interviewed them all at least three times previously. My relationships with them and status as an "insider" for Newark schools contributed to an easy feeling between us, although I understood well how power relations—my own positioning as a researcher and previous status in the program—could have positioned me as a power figure in their eyes. I also felt somewhat protective of them, having been part of their growth and development the year before, and I could not help having a personal desire to see them succeed and feel successful—especially Bruce, with whom I felt a special kinship because his looks and mannerisms reminded me very

much of my younger brother. I realized early that my connections to the program and my personal relationships with the participants would necessitate the recruitment of critical friends to help me interrogate my biases, which I discuss further in the trustworthiness section.

Data Collection

The chart below provides an overview of the data sources I collected over a five-month period commencing in September, at the start of the school year. The five-month time period was necessitated by my own timeline for research. Data sources included classroom observations, observation debriefings, semi-structured interviews, field notes, and a researcher journal.

Data Source	**Description**	**Number**
Classroom Observations	I conducted 2-3 observations per participant during the first month of school. I observed one full instructional unit with each teacher between October and December. I concluded with a mini-unit for each teacher of 3-4 observations. I scripted each observation.	June: 13 Mauro: 11 Bruce: 16
Observation Debriefings	Each lesson observation during the full instructional unit was followed by a short post-observation interview. During this time the participant reflected on the lesson, discussed instructional choices, and answered other questions that arose from the observation.	June: 7 Mauro: 5 Bruce: 10
Semi-Structured Interviews	For each participant, I conducted 2 semi-structured interviews of approximately 60-90 minutes in length, one at the start and another at the conclusion of the study to provide an understanding of the work of teaching taking place beyond observations, probe teacher thinking about practice, and present preliminary study themes.	2
Field Notes	I recorded my own interpretations before, during, and after observations in the form of field notes, which I later typed and use to supplement observational scripts.	n/a
Researcher Journal	I maintained a researcher journal to record methodological decisions and the thinking that accompanies them. The journal also served as a method to record my own emotional responses to the unfolding	n/a

	research.	

Observations

Because the study focuses on teachers' negotiation of practices in the classroom setting specifically, the main data source of the study was classroom observations. Observations allowed direct documentation of teacher practices and the viewing of the interactions between teacher and students in a naturalistic setting, over time, that influenced the development of those practices. Observations, then, facilitated a first-hand encounter with the phenomena under study (Merriam, 2009). I conducted observations as a participant observer, which Adler and Adler (1998) consider a "peripheral membership role" (p. 85). As a participant observer, I made my research activities known, but did not intentionally take an active role in classroom happenings. Despite my aim to remain in the background, I was occasionally drawn in to become a part of the fabric of the classroom—I myself became a part of the classroom assemblage. For example, students would sometimes approach me to curiously ask, "What are you writing? Are you writing about me?" For the most part, however, I tried position myself in a corner to observe classroom happenings unobtrusively.

My total number of observations varied for each teacher. Because I was interested in the construction of practice, I made the decision to observe each study participant for the length of one instructional unit, so that I might see several consecutive lessons that supported a larger learning objective. For June and Mauro, whose classes were eighty-minute periods, this meant I observed seven and five classes, respectively. However, for Bruce, whose classes were only forty minutes, one unit spanned ten classes.

In addition to the complete unit, I observed each teacher two to three times in September, as their schedules allowed, to get an understanding of classroom dynamics. Finally, I observed a "mini-unit," which consisted of three to four classes for each teacher, toward the end of the first semester, to note any additional changes or developments that might have taken place since the observed unit. Because each class is a unique composition of the teacher, students, content, forces, and objects that can shape what the teacher can do, I planned my data collection schedule to observe as many different periods as time allowed so that I might see multiple "teaching-assemblages" for each participant.

During each observation, I combined the overview and scripting methods of note-taking (Acheson & Gall, 1992), alternately capturing what was done and said during the lesson with as much detail as possible. Because my question focused on the construction of practice, I gave particular attention to the teachers' instructional methods and strategies and interactions between the teacher and other individuals in the class. For each observation, I kept separate field notes to record my own thoughts, apart from the script, during the lesson. In my field notes, I included new insights, connections to theory or other data, methodological decisions, or personal reactions to what I was seeing.

Observation Debriefs

After observing each lesson in the full instructional unit, I conducted a 15-20 minute debriefing session with the teacher. This "observational debrief" provided an opportunity for me to informally interview the teacher regarding the process of teaching and the lesson itself. The debriefing session took place either directly after the lesson was taught or at the conclusion of the school day, as the teacher's schedule allowed. This

short, informal interview was critical to capture the in-the-moment thinking that might not be possible for the participant to reconstruct at a later time. I also used the observational debrief as a way to confirm or disconfirm my own impressions from the particular lesson or probe further on specific topics. As the unit progressed, the information and reflections the teachers provided in the debriefing sessions, together with the observations, helped to focus the emerging connections I was beginning to make, and I brought these to the attention of the teacher as a way of member checking. Each debrief was recorded and transcribed verbatim. I used these transcripts, along with my observation scripts and field notes, to write a more complete, narrative account of each lesson after the observation.

Interviews

While observations and observation debriefs were central to the main research question, semi-structured interviews with the teachers were a critical complementary data source. Planning and other preparation, teacher beliefs and background, and factors from outside the classroom—such as testing pressures, school policies, or school structures—also influence the process of teaching that occurs in class. Interviewing participants provided a window into teacher thinking and "outside elements" that might not have been apparent in observations but are essential for constructing an understanding of the ongoing process of negotiating teacher practices. Methodologically, discussing the practices and interactions recorded with teachers is essential for trustworthiness and member-checking purposes. Observations are always subjective because as the researcher I record what I see, which is influenced both by the theoretical

perspectives/positioning that I bring as to the task and by virtue of the limitations of a non-recorded in-person observation (versus videotaping, where I might be able to replay the lesson multiple times). During formal interviews, the participants are able to provide clarification, confirmation or disconfirmation, fill in gaps, and/or build on emerging themes or ideas presented by the researcher about the participants' practices, which increases the likelihood that analyses and understandings are collaboratively constructed by the researcher and participant.

I conducted two semi-structured interviews with each participant (Merriam, 2009), one at the beginning and one toward the end of the five-month data collection period. The original interview provided a glimpse into the teacher's thinking and perception of her work as she transitioned into first-year teaching. I developed a set of open-ended questions prior to the interview (see Appendix A for interview protocols), which served as a guide rather than a strict protocol (Patton, 1990). This set of open-ended questions enabled me to address the same general issues with each participant, but still provided the ability to conduct the interview in a conversational, flowing format. I chose open-ended questions (as opposed to "yes" or "no" questions) to allow participants to expand on each topic. I asked questions such as, "What have been your successes so far?" "What have you found to be challenging, and why?" "Given your internship year at [high school], what were you able to anticipate this year, and what surprised you?" "Describe your ideal lesson…are you able to achieve that vision? Why or why not?"

The purpose of the second, and final, interview was to probe the teacher's thinking about her work and her perceived development over the initial five months of

teaching. This interview was also an opportunity to follow up on themes that I had noted or topics I thought would be fruitful as the data collection neared its conclusion and I began analysis in earnest. I asked questions such as, "What kind of supports have you received, and how has that impacted what you are able to do in the classroom, if at all?" "How have you changed as a teacher over the semester, instructionally, personally, professionally?" "What from your learning last year have you been able to use, and how have you put it to work?" "What haven't you been able to do, and why?" This second interview was also critical for presenting emerging findings to the participants for their feedback, which helped me identify my own biases or possible misinterpretations or misunderstandings (Maxwell, 2005). As I conducted each interview, I reflected back to the participant when possible as a member check: "So what I'm hearing is…" Each interview was approximately 60-90 minutes and was audio-recorded and transcribed verbatim.

Researcher Journal

During the study, I kept a researcher's journal to record methodological decisions as well as reflect on my own experiences, reactions, and understandings as the research study unfolded (Ortlipp, 2008). The journal also was a place for me to work out and reflect on ethical issues related to my role as researcher and my relationships with the participants, which sometimes became messy. For example, early in the year I found the transition from coach and mentor to researcher to be difficult. The primary purpose in my interactions with the teachers had fundamentally changed. I was not observing the lesson for the purpose of helping them grow as teachers (or at least not directly), but rather to

investigate a research question. In the teachers' minds, however, my role had not changed, and I found myself having to negotiate a new space in their lives. My own emotions often became entangled with the research as well: when I came to Bruce's classroom after observing the other two teachers' units and I witnessed his struggles, I felt crushed and upset for him. My researcher journal became a space where I worked these feelings out and asked the questions, *who am I to my research? What is my research to me?*

Analysis

My data analysis encompassed two related processes—rhizomatic mapping and situational analysis. In seeking a method compatible with the rhizome, I found that a general set of specific rhizomatic methods do not exist. Indeed, researchers operating within this paradigm often comment upon "…the impossibility and undesirability of prescribing a set of methods to be used in following Deleuze and Guattari's work" (Honan & Sellers, 2008, p. 124). To employ an analytic method that would allow me to probe the multiple, situated, and relational activities comprising teaching, I blended components of a constructivist, postmodern grounded theory approach (Charmaz, 2005; Clarke, 2003) with rhizomatic mapping (Deleuze & Guattari, 1987; Hagood, 2002).

Grounded Theory

Rather than beginning with concepts or theoretical constructs as an overlaying framework, grounded theory—as its name suggests—grounds analysis in the data as a starting point. Similarly, rather than using the data to "test" my social justice and rhizomatics framework, I instead sought to locate my "findings" in the observation

scripts, interview/debrief transcripts, and field notes, and reason inductively, using theories of social justice and rhizomatics to explain and contextualize findings. The basic approach of grounded theory data analysis normally involves open data coding as an analytic first step, during which the researcher assigns labels to phenomena (Clarke, 2003). Codes are then used to create categories and begin writing analytic memos (Strauss & Corbin, 1990). These categories and memos are compared to the literature, other data, and new research, and constantly revised, a process called the *constant comparative* method (Glaser & Strauss, 1967).

My process approximates this grounded theory approach. However, while traditional conceptions of grounded theory promote a view of the researcher as more distant, allowing themes or patterns to "emerge" from data, I ground myself in a firmly constructivist view (Charmaz, 2002) that situates meaning in-between the researcher and participant, in-between the reader and the researcher, and in-between the researcher and data (Ellingson, 2009). Charmaz (2011) argues for development of a "grounded theory for the 21st century that advances social justice inquiry" (p. 508) based on this constructivist tradition. Such a method offers pragmatic tools for studying micro-level change processes drawn from more traditional grounded theory guidelines, but resists appropriating its rationalist roots and objective data stance (Ibid).

Clarke (2003) also argues for a more complex understanding of grounded theory that focuses on the research situation itself as a unit of analysis. "Situational analysis" (p. 558) is more explicitly relational and postmodern, distancing itself from traditional grounded theory's objective researcher/data outlook and moving from a focus on social

process to a more "ecological root metaphor" (p. 558) of social situations and the negotiations that occur within them. This method also adds an analytic layer of maps that show situational elements in their collectivity, how these elements interact and negotiate, and the issues, discourses, and/or positions that contribute to social processes within the situations under study (Ibid). From these maps, researchers proceed to produce memos and engage in substantive theorizing (consistent with a focus on process rather than a product of substantive theory) (Ibid). The philosophical stance underlying this variation of grounded theory, the potential to explain processes of change, the ecological focus on the collective situation (which I paralleled to the concept of *assemblage)*, and the situational map-making all aligned with my conceptual frames and study aims.

Rhizomatic Mapping

My initial analysis consisted of the creation of rhizomatic maps (Deleuze & Guattari, 1987; Hagood, 2002), which also approximates the mapping stage of situational analysis (Clarke, 2003). I label these maps as such because they simulate properties of the rhizome (Waterhouse, 2011)—they lack a central point of departure or locus of organization, offer multiple points of entry to the reader, expand via heterogeneous connection, and emphasize multiplicity (Deleuze & Guattari, 1987; Strom & Martin, 2013). Rhizome mapping is, however, different from *rhizoanalysis*, an analytic method that requires 1) rhizomatic writing seeking to avoid linearity in text and thought construction, 2) nomadic interactions and linkages between, across, and among texts and other data sources, and 3) a variety of interpretive paths that can be taken during analysis (Honan & Sellers, 2008, p. 124). Although some commonalities exist between them,

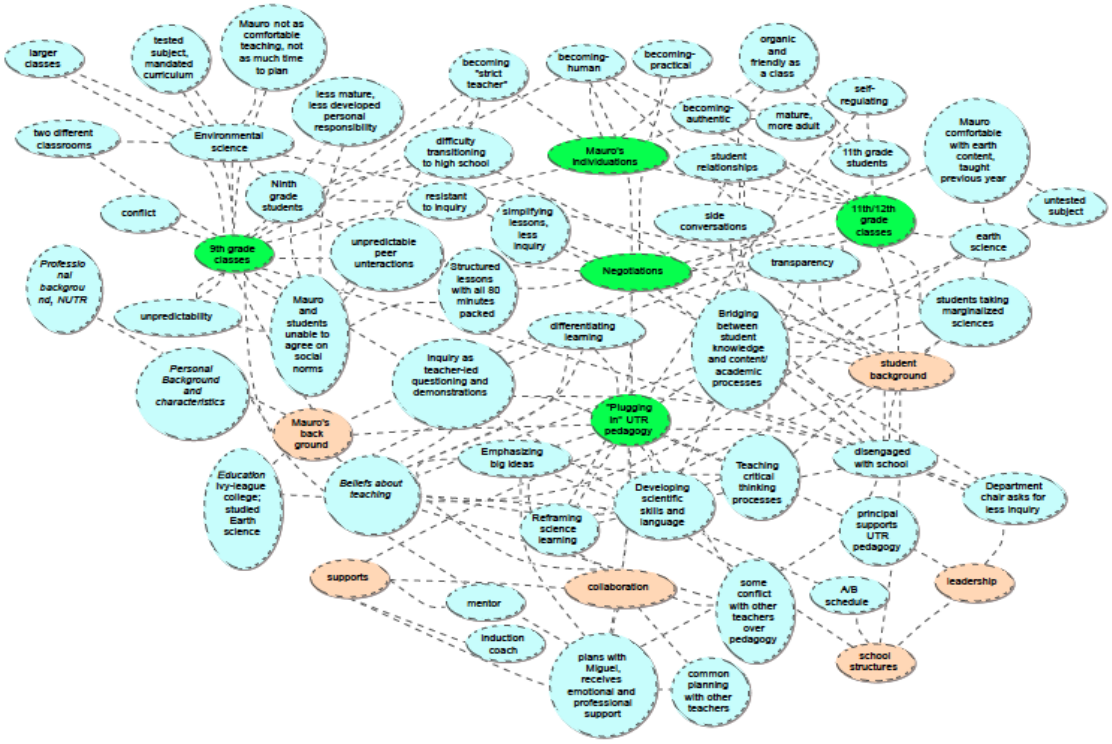
including the grounding in the properties of the rhizome and concern with relationships, the method of rhizomatic mapping I used does not extend to writing and reporting. Rather, I used it as an analytic tool to create and experiment with possible "assemblages" of data and theorize relationships among them.

My first step in creating rhizomatic maps involved strategy of *data walking* (Eakle, 2007; Waterhouse, 2011), an inductive approach to exploring data. In data walking, the researcher meanders through the data freely, without a map (codes one might have in mind). As I walked though the data, I marked or highlighted sections of interest and began to note connections between the data and the theoretical literature, the empirical literature, and other data sources. For example, I noted several contradictions existing between Bruce's interviews and his actual teaching, and connected textual data regarding these instances to empirical novice teacher literature discussing the "double bind" (Achinstein & Ogawa, 2011, p. 140) that occurs when teachers believe and profess one set of beliefs, but are not able to carry them out for internal or external reasons (Massengill, Mahlios, & Berry, 2005).

Taking a cue from Bowles (2001) and Waterhouse (2011), I used the data software *Inspiration* to record connections from the data sources, group similar ideas together, and make further linkages. This simulated a version of a discovery and coding approach (Bogdan & Biklen, 1998), but focused on connections, interactions, and processes rather than categories. I moved ideas from the data into an Inspiration document, with my research question at the top. Using circles with dotted lines to connote the open and fluid nature of these data, I entered main ideas and clustered them

together in ways that related to the facets of constructing practice, such as “Negotiating NUTR practices,” “Constraining conditions,” and “Negotiating with students.” From these I linked more “open” circles, adding data from observation scripts, debrief and interview transcripts, field notes, or my journal, which supported the linkages that were being made. As I plotted these, I began to make connections between and among the concepts, indicating these with non-directional, irregularly curved lines. Figure 1, below, provides an example of a rhizomatic map for Mauro.

Figure 1
Mauro Rhizomatic Map



I hesitated to call the above-noted clusters of main ideas “codes,” as I wanted to treat them as fluid and overlapping. The very word “code” also evokes the Deleuzian use

of *overcoding*, another name for the molar lines that stratify our existence (Deleuze & Guattari, 1987). While some Deleuzian researchers might resist the development of themes, patterns, or tendencies, I contend that as long as one does not present them as the single truth or reality, presenting themes, main ideas, and patterns can help give the reader an organized and systematic overview of complex phenomena (Ellingson, 2009). Additionally, contemporary grounded theory "theming" differs from other interpretive qualitative coding, focusing on actions and processes rather than topics or things (Charmaz, 2000). As previously noted, this perspective is consistent with a Deleuzian focus on processes, as well as larger agendas of change for social justice (Charmaz, 2011).

Situated Analysis Mapping

The first step in situational analysis is to create "abstract situational maps" which name "who and what" matter in a specified research capacity. These should include "all analytically pertinent human and non-human, material and symbolic/discursive elements of a particular situation as framed by those in it *and by the analyst"* (Clarke, 2003, p. 561, emphasis original). The rhizomatic maps I had previously created simulated this, so I progressed to a second step, creating an "organized" version that identified the major elements present in each teacher's case as related to the construction of practice (see example in Figure 2 below).

Figure 2

Situational Analysis Chart for Bruce: "Who and What Matter in the Situation?"

People	Bruce; Students; Mentor; Roommate Teacher; Induction coach; Principal(s)
Setting	• Northeastern College Prep • Shared classroom

	• Room not set up for science class, no equipment, lab space	
Enabling conditions	**Elements Bruce brought** • Commitment • Coachability • Kids like him, find him interesting	**Elements in the environment** • Student enthusiasm • Only taught 3 classes, no more than 20 students • Lots of time to get to know students
Constraining conditions	**Elements Bruce brought** • Not reflective • Difficulty "noticing" • Molar lines within: constant testing, beliefs about separation of conceptual and procedural	**Elements in the environment** • Co-location with other schools • General school dysfunction=constant interruptions • Students are bussed in, can't stay after school • Student absences • Sharing room with Fr teacher • Student behavior • Mismatch in school culture, principal beliefs about pedagogy • Lack of support, feedback • Isolation- no other physics teachers
Pedagogy	• "Direct instruction with "breakout demonstrations" • Inquiry-based projects • Collaborative problem solving • Democratic methods	
Dilemmas/ Problems of practice	• Providing scaffolds for labs and assignments • Designing labs that are engaging and connected to content in meaningful ways • Conflict between management styles • Continuing to develop reflectiveness, noticing • Unpredictability	

As a third step, I theorized the lines I had drawn or the connections made within the rhizomatic maps. I considered these the social negotiations within each assemblage—that is, the interactions between important elements that shaped each

teacher's ongoing teaching practices. To record them in an organized fashion for further analysis, I created a third chart specifying the ways that each element seemed to influence the ongoing processes of classroom activity (see example, also drawn from Bruce's case, in Figure 3, below).

Figure 3

Situational Analysis Map for Bruce: "What are the Social Negotiations in the Situation?"

Classroom Element	Connection to Classroom function
Students, student relationships	• Students resist math; B brings in conceptual; Students disengage unpredictably during math portions. • Student enthusiasm • Student dynamics very unpredictable due to student-student conflicts=occasional interruption of lesson. • During active learning, demonstrations students very engaged, energetic, excited. • Some students seem very motivated and sometimes "take lesson into their own hands"
Bruce	His own ideas on teaching, orientations to teaching, personal capabilities influence practice: • Constant testing • Separation of conceptual/procedural • Lack of attention to scaffolds in planning • Worry about "other teachers", "out there" teaching, not wanting to stray from the norm Bruce's openness, commitment to student relationships helps foster open, comfortable environment
Principal, leadership change	• Change in leadership creates instability: the previous principal was on-board with inquiry methods, while the new principal focuses on discipline • B receives conflicting messages from the principal; mismatch in philosophy about management; creates worry, lack of confidence, struggle between more

	• Principal interrupts classes
School dysfunction	• Frequent interruptions put B behind, make it difficult to have cohesive classes • Lack of supplies, texts, equipment • Instability from leadership change • Lack of space/roommate teacher
Lack of support	• B felt "abandoned," forgotten; no one to reinforce NUTR pedagogy or help identify/ work through problems of practice
PSI Curriculum	• Math-based, B sees as very traditional • Creates tension because he feels he is expected to follow the PSI curriculum

Although the rhizomatic and situational analysis maps allowed me to identify the salient processes that shaped the teaching practices of study participants, those teaching practices were mediated by multiple factors encompassing human actors, material aspects, and contextual conditions. Because the maps contained only summaries of the main themes I had constructed and lacked details about these multiple influences, the maps and charts began to feel decontextualized. The need to re-contextualize my data in light of the connections I had made in the mapping phases took me into my next layer of analysis, "memo-writing" (Charmaz, 2006, p. 72). As I pulled evidence to map and plot into the charts, I also began to write analytic memos from the rhizomatic and situational analysis maps, developing main ideas in more detail and creating lengthier descriptions of events to re-situate my data. To do so, I revisited multiple data sources—my own annotated memos and journal, the observation scripts, the debrief interviews, and the formal

interviews—and began to form "data stories" (Bowles, 2001, p. 131) that would later serve as examples and illustrations of the key processes of constructing teaching practice.

Presentation of Cases and Discussion

The three cases are each structured in four main parts. The first section in each of the cases orients the reader to important background information about each participant and his or her setting. This section corresponds to the first step in situational analysis: identifying *who* and *what* matters in the situation (Clarke, 2003). For me, this meant identifying the case elements that contributed to each of the participants' construction of practice and processes of becoming a teacher. Although these vary to some extent across participants, each case at a minimum provides a portrait of the teacher her/himself; the school and classroom setting; the student population; and other persons who contributed to the practices produced (school-based mentor, induction coach, principal, and so on).

The remaining three sections address my research question, "Given their common experiences of preservice preparation of a hybrid urban teacher education program, how do three first-year teachers negotiate their pre-professional learning with their new environments to construct practice?" The second section of each case presents data on three processes the participants' engaged in as they constructed their teaching practices. These include the ways they attempted to enact their learning from the NUTR, the negotiations they engaged in with students to engage them in learning, and the teacher identity development each participant experienced. The third section presents data and analysis of the contextual conditions of each participant's setting that may have enabled

or constrained their practice. In the final section, I "think with rhizomatics" (Mazzei & Youngblood Jackson, 2012), or use particular rhizomatic concepts as a lens, to briefly discuss the case participant's negotiations of practice.

I follow these three chapters with a discussion that looks across the three case studies. Using key rhizomatic concepts as analytic tools, the discussion illuminates common processes between and among the cases, highlighting the non-linear connection between teacher learning and practice, the fundamentally relational nature of teaching, and the challenges of constructing a practice of equity teaching during a teacher's initial year in the profession. In the concluding chapter, I offer recommendations for teacher education, policy, and research based on the study and reflect on my own research process.

Role of the Researcher

My own interests, experiences, beliefs, and positionalities necessarily informed and shaped this study. As Bott (2010) notes, "Central to maintaining reflexivity is the need for researchers to constantly locate and relocate themselves within their work" (p. 160). Intensive, ongoing efforts to examine the role of the researcher in and to the research are also an emphasis of post-qualitative research (Ellingson, 2009; St. Pierre, 2011). Throughout the study, I have maintained a researcher journal and engaged in ongoing conversations with my mentors and critical friends to position myself and explore the ways that I became part of the research and teaching assemblages in order to provide as much transparency as possible as I wrote the final product. My identities as educational activist, former urban teacher, teacher educator, and researcher have spurred

my interest in this study, shaped its design, and will continue to inform future iterations. My experiences as an urban educator and school leader draw me to research regarding quality, effective pathways to urban teaching as well as fuel my commitment to research and teaching that will lead to broader, societal change addressing culturally sanctioned, institutionalized racism, sexism, and classism. Furthermore, my political beliefs, including my resistance to encroaching market-based reforms that adopt simplistic, linear formulas to evaluate teaching and learning, has led me to seek different epistemologies, conceptual frameworks, and research methods that can account for the unpredictability and non-linearity that characterize teaching. These factors contributed to my adoption of a conceptual framework involving social justice and rhizomatics and a post-qualitative methodology.

As a fledgling teacher educator and doctoral fellow, my interest in innovations in urban teacher preparation led to my assignment to the hybrid teacher education program featured in this study as part of my fellowship. As previously noted, I served as an NUTR faculty assistant for two years. I collected data from the program, which included interviewing and observing preservice teachers, including those who participated in this study. I also led supplemental workshops on topics such as content area literacy and classroom management. Additionally, I completed my doctoral practicum as an induction coach for the first three graduates of the program, providing mentorship and advocacy during their first year teaching.

As a result, I have developed close relationships with lead faculty members, one of whom is my advisor and mentor. I have also had the opportunity to interact

professionally and socially for the last year with the preservice teachers who will be my future research participants. To address obvious ethical concerns, I stepped out of my role as faculty assistant and induction coach with the NUTR, which limited my interactions with research participants outside of my new role as researcher. However, I had pre-existing relationships with all participants, having served in a former capacity as faculty assistant. This had the potential to influence the researcher-participant relationship in different ways, although prior relationships can also help establish rapport (Garton & Copeland, 2010). Because my title was "faculty assistant," I have not been the principal authority during their preservice education, but I have occasionally facilitated a workshop and filled the role of instructor, which may have influenced the power dynamics of our relationship.

Orienting myself in a post-qualitative positionality means acknowledging, upfront, the power imbalances inherent in the researcher-researched relationship. From the beginning, I committed myself to "working the hyphen," (Fine, 1994, p. 70), interrogating notions of the distanced, neutral researcher who keeps her "self" out of the study. Although by virtue of positioning myself as "researcher" to their "researched," I automatically invoke a power imbalance, I sought out strategies to try to mediate this binary. One such strategy, self-disclosure in interviewing (Abell, Locke, Condor, Gibson, & Stevenson, 2006), meant telling teacher-stories from my past as my participants shared their own. As Harrison, MacGibbon and Morton (2001) note, "Through judicious use of self-disclosure, interviews become conversations, and richer data are possible" (p. 323). I also spoke explicitly with my participants about the nature of my inquiry and the tensions

of formerly being an insider, a doctoral assistant in the program and an induction coach, who now was supposed to be studying them as an outsider. As I was asking them to share their stories with me, I also shared my stories with them about my life, my progress with my job search, and my impending move to California. At the same time, I tried to avoid the possibility of exploiting the relationships I had built (Harrison, MacGibbon, & Morton, 2001). For example, I tried to ensure that I was mindful of the time commitment the teachers had made and the heavy workload each carried. I always scheduled meetings either at their schools or near their homes for interviews, although I knew that if I asked it of them, they would have driven to the university or to a location that was closer to my home.

The researcher has incredible power to tell the story she wants to tell, to seal "othered" groups in a "textual lamination" (Fine, 2001, p. 71). While perhaps some might argue that at least two of my three participants do not constitute "others" in the traditional sense of oppressed groups, within the context of educational research, teachers, their milieus (the classroom and school), and the knowledge they produce are often subjugated to those of the researcher/university professor. Although ultimately I admit that I write the final product, throughout the process I tried solicit feedback from participants, speaking with them in formal interviews and before and after their lessons to discuss my interpretations. I considered these discussions to be collaborative theorizing, as they were opportunities to mutually construct and mediate meaning in-between the researcher and participant (Ellingson, 2009).

Ethics and Trustworthiness

I employed a number of strategies to attempt to create as transparent and rigorous a study as possible to convince the reader and academic community of the validity, or trustworthiness, and relevance of this work. The notion of validity, as traditionally characterized by academic research, speaks to the legitimation of generated knowledge (Lather, 1993). Because the purpose of this study is not to necessarily generate knowledge, but rather to produce thinking, the concept of trustworthiness—the argument that a study's findings are "worth paying attention to" (Lincoln & Guba, 1985, p. 290)—is more suited to my purposes than validity for demonstrating that the research is rigorous, authentic, and contributes to understanding. This last criteria of "understanding" is particularly important because my study, in the Deleuzian tradition, fundamentally seeks to investigate the question of "How does it work?" in relation to first-year teaching practice.

Issues of trustworthiness are, at their heart, issues of quality. Rather than asking if a study's findings match reality or can be reproduced exactly, trustworthiness seeks to establish credibility and plausibility (Merriam, 2009). Strategies of triangulation (Mathieson, 1988) are a common approach to increasing a study's trustworthiness. The term *triangulation*, however, implies a notion of the fixed points and rigidity that seems contradictory to a research study with postmodernist sensibilities. Instead of triangulating between points, I turn to the idea of crystallization (Ellingson, 2009; Richardson, 1994), which as a form of "validation" aligns with the ideas of multiplicities invoked by the rhizome and of the multiple subject positions that necessarily influence my research. Richardson (1994) notes,

> Crystals are prisms that reflect externalities and refract within themselves, creating different colors, patterns, and arrays casting off in different directions. What we see depends on our angle of repose—not triangulation but rather crystallization. (p. 963)

To this end, I designed the study to provide multiple opportunities for crystallization at every stage of research, linking and searching for commonalities or confirmation of findings among and between interviews, field notes, observation scripts, and debriefs. The inclusion of multiple cases also offer an opportunity for crystallization—as Miles and Huberman (1994) note, " By looking at a range of similar and contrasting cases, we can understand a single case finding, grounding it by specifying *how* and *where* and, if possible, *why* it carries on as it does" (p. 29). Additionally, I present findings in thickly descriptive case studies, allowing readers to evaluate whether the study findings are transferrable to their own contexts.

Because I have previous relationships with the participants and a history with the program, I am transparent about positioning myself in relation to the research and illuminating the assumptions I bring to the study. I have continually reflected on and interrogated my practices through my research journal. To help mediate possible biases, I embedded member checks into interviews and presented theme constructions to participants throughout the process, incorporating their feedback and expansion on these ideas. I also shared findings with my dissertation work group in an iterative manner, so they could serve as critical friends (McNiff, Lomax, & Whitehead, 1996) as well as mentors and advisors. A critical friend is "a trusted person who asks provocative

questions, provides data to be examined through another lens, and offers critique of a person's work as a friend" (Costa & Kallick, 1993, p. 50). As someone who has been totally immersed in the NUTR program for the past two years, I relied on my critical friends to play an important role in helping me to mediate my biases as much as possible. I set up regular meetings with two of my dissertation committee advisors, during which I shared my preliminary and emerging interpretations, tensions, and connections. During these meetings, my advisors posed pointed questions about my work, asked me to articulate rationales and reasoning, and offered critique, all of which were critical in gaining feedback and checking my own perceptions. In addition to meetings with my mentors, I also was working with two fellow doctoral students on separate self-study projects, and I brought my work to these contexts to share, interrogate, and be interrogated.

Limitations

While the study holds potential for providing possible understanding of the complex nature of the construction of first-year teaching practices of graduates of hybrid urban teacher programs, the study findings will not be applicable to all first-year teachers. In addition to the contextual difference of the teacher settings, the particular hybrid teacher education program in this study has many features that contribute to its unique nature, including induction supports provided in addition to district mentorship and new teacher professional development, an explicit inquiry and social justice teaching focus, and a year-long practicum in either the same or a similar teaching environment to the first-year placement. The program itself also has an extremely rigorous admission

process, explicitly seeking not only candidates with deep subject matter expertise and exceptional academic abilities, but also those who exhibit the characteristics of successful urban teachers (Haberman, 1995), including resilience, commitment, and flexibility. Therefore, teachers in this study may have somewhat different qualities from those of the average candidate.

The knowledge produced by the study is also, as previously noted, partial. In addition to being rendered partial by my own positioning and perspectives, the data also precludes much of the voice of the student—an extremely important actor in the classroom act of negotiating teaching practice, as will be demonstrated in the cases that follow. While these issues point to certain limitations of the study, I believe that the study has the potential to inform teacher preparation and support of teachers through the induction phase. Through thick, rich description and multiple methods aiming to show complexities of enacting practice, I hope to provide accounts that yield transferrable thinking.

I also acknowledge a tension existing between the postmodern and rhizomatic theoretical and methodological frame of this study and the linear, discrete organization of the case studies (and, it might be argued, the dissertation as a whole), which some scholars may view as a limitation, especially given my stated aim to trouble the normalized conceptualization of teaching practice. Although, as previously noted, no set protocols exist for creating a rhizomatic study—much less a rhizomatic dissertation—researchers who claim affinity with such perspectives might stress the importance of a writing style that seeks to avoid linearity in text construction (Honan & Sellers, 2008).

The linear organization of this dissertation study reflects multiple conflicts I encountered on my research journey. I speak to these tensions in the concluding chapter and suggest that although the research presented here may be seen as normalized, "micro-transgressions" have occurred which hold promise for shifting perspectives from the individual to the multiple and from a static view to the process view.

Chapter Four: Mauro

In this chapter and the two that follow, I aim to complicate the notion that teacher learning is transferred, whole, from the university into the classroom. To demonstrate the complexity of putting preservice learning into practice during first-year teaching—particularly when the practices learned challenge customary teaching in schools—I present the cases of three urban high school science teachers. These cases reveal the intricate work the teachers undertook as they modified pieces of their preservice learning to "fit" the specific conditions in their classroom settings, built relationships with students to engage them in their learner-centered teaching practices, and began constructing a sense of identity as equity-minded teachers. This challenging work involved multiple and ongoing negotiations with various elements within the setting, most centrally with students. While none of the teachers made a "perfect" transition to teaching, examining their experiences illuminates the demanding work such transitions entail and offers important insight into ways of supporting new teachers in learning to teach.

This chapter focuses on Mauro, a high school teacher of eleventh and twelfth grade earth science and ninth grade environmental science. In developing the case, I first provide information about Mauro's background and the setting where he taught during his initial year of teaching, giving attention to actors and key aspects of the setting that helped shape his early practice. Next, I delve into Mauro's day-to-day teaching. Because Mauro had distinct experiences teaching his two science subjects and grades, I discuss his teaching of earth science to "upperclassmen" (eleventh and twelfth grade students) and

environmental science to “freshmen” (ninth grade students) separately. In examining Mauro’s teaching of each subject, I focus on how he worked out ideas about teaching learned in the NUTR program; negotiated student engagement in learning, a process that required him to adapt his ideas about teaching; and developed distinct notions of teacher-self. Finally, I provide an overview of the contextual conditions that contributed to the divergent practices enacted within Mauro’s two subject areas and offer interpretations for these marked differences.

Case Background

Mauro’s Background

At the time I began collecting data for this study, Mauro (a pseudonym chosen by the participant) was twenty-four, dark-haired, slight of stature, and self-identified as gay. A self-proclaimed “type A” with a “perfectionist mentality,” Mauro was also, by his own admission, “a little judgmental” of others. Born in a large metropolis in the northeast, Mauro was the child of immigrants, one from Cuba and one from Colombia. From an early age, Mauro developed a love of learning and an acute understanding of the importance of education, which he attributes to his parents and grandfather. His mother had not finished high school, and his father was a high school graduate; both emphasized they had come to America for the benefit of future generations and expected their children to take advantage of the educational opportunities the U.S. had to offer. His grandfather, Mauro remembered, had also always encouraged him to “keep going to school.”

Mauro's mother was the children's primary caregiver, and his father and two sisters both worked in retail. Mauro thought the latter's career choices might have spoken to the family's shared talents for interacting with people, what he called their "people skills." His family was solidly working-class and Spanish was mainly spoken at home. In school, Mauro paid special attention to his English classes and was attentive to developing his grammar. He said, "I knew the decks were stacked against me, not growing up in a fluent English household…I don't think I was ever read to as a child, and I just know the effects it had on my development of speaking English." Despite the importance he placed on English, Mauro also had a "yearning for math and science." Bolstered by his family's emphasis of the importance of education and his own love of learning, Mauro excelled in his K-12 schooling.

Mauro went on to one of the premier Ivy League universities in the country, initially majoring in applied mathematics. In his junior year, realizing the depth of his commitment to environmental justice and growing awareness about climate change, he changed his major to environmental science. After graduating from college, Mauro returned to his hometown, while he considered his options for graduate school. He decided to take a year off until he had made a decision. In the meantime, Mauro accepted an office assistant position at the college that sponsored the Northeastern Urban Teacher Residency (NUTR) program. He was encouraged to apply to the NUTR by colleagues and did so "as a sort of novel thought." However, going through the interview process, meeting other UTR applicants, and talking with program graduates who were teaching got him "really thinking about the benefits of public education." This new awareness,

combined with the opportunity to teach subject matter about which he was passionate—environmental and earth science—spurred him to accept a position as a member of the residency's second cohort.

Alongside other NUTR cohort members, Mauro studied inquiry-based teaching methods, culturally and linguistically responsive teaching, socio-cultural learning theory, differentiation of learning, student-to-student discourse, and strategies for infusing instruction with social justice perspectives. Core NUTR curriculum also included instructional planning using Understanding by Design (UBD) (Wiggins & McTighe, 2005), an approach that emphasizes beginning with an objective in mind and organizing instruction around a few main connected concepts. In courses taken as part of the NUTR, Mauro stood out as an enthusiastic collaborator and ardent inquirer. He connected right away with several other cohort members and credited the "sense of community we developed" with their collective success during the residency year. In classes, Mauro was often the first to speak up with questions about assignments, asking for clarifications or requesting further rationales for learning goals and activities.

Discussing his preparation for his first year of teaching, Mauro identified the UBD framework and its emphasis on cohesive, connected, long-term instructional planning as "the single most successful thing for us [the residents]." He expanded, "It makes for a lot of ease, just in terms of planning…having to write lesson plans goes by really quickly for me." However, Mauro experienced some difficulty with other key elements of the NUTR pedagogical vision. For example, though Mauro appreciated inquiry from a scientific standpoint, he struggled to understand the concept as a

philosophical orientation to teaching. During my initial interview with him, Mauro admitted that he still grappled with understanding the meaning of teaching through inquiry, as the NUTR presented it (which blended both scientific inquiry and Freirian perspectives):

> I …I never fully got what inquiry was … what I started to understand is that you don't fully get it, ever, because you are constantly redeveloping what inquiry is… but I think that's where I still have the disconnect…I know structurally what inquiry looks like, and what the key components to it are, and what should the students be doing, what should the teacher be doing, and I get all that, but I think some of the aspects in terms of execution, I'm still a little hazy on.

During his residency year, Mauro co-taught eleventh and twelfth grade earth science. His students were those who had been identified by the school as "not having the skills to take chemistry or physics," and thus had been tracked into earth science—a subject considered less rigorous and requiring a lower level of mathematics understanding. As is common with instructional lower tracks (Oakes, 2005), English language learners and special needs students were overrepresented in Mauro's classes. Mauro's mentor was well versed in providing academic and socio-emotional differentiation and supports for students, as both a highly regarded earth science teacher with a second degree in social work (and served as a case manager on nights and weekends). Mauro felt his residency experience had prepared him well to differentiate instruction for his students and also gave him an understanding of the importance of getting to know students and building relationships with them to meet their needs.

Beyond his commitment toward educational and environmental social justice, Mauro brought to teaching an orientation geared toward question-centered and meaningful practice that emphasized processes of critical thinking, reflection, and one-on-one or small group instruction. Mauro described "constant questions" as "a cornerstone of how I approach learning." He added, "I like to make it as question-based and just reflecting on those questions…providing them with…a bunch of questions to work with and giving them time for each question, to really think about it." He saw himself teaching thinking processes in science, not just teaching *science*. His previous year spent in an inclusion setting had taught him that the best learning happens either in one-on-one or small group arrangements, which give students opportunities to learn at their own speed. During the debriefing session after completing the first lesson in the instructional unit I observed, Mauro commented: "You have to let them go at their own pace. I can't just *shovel* [the content] into them."

School and Classroom Settings

Immediately after completing his residency year, Mauro was hired to teach ninth grade environmental science and eleventh and twelfth grade earth science at Lincoln High School (a pseudonym), the same school where he apprenticed. Lincoln was also the original NUTR partnership high school where the program began placing graduates in 2010. Mauro believed teaching in a familiar setting helped smooth his transition from preservice resident to first-year teacher. He noted, "Just having…a community of professionals who, you know their work, and you know how the system works…rather than having to figure out a whole new jungle gym."

Lincoln High School was large in size, comprised of four, four-storied buildings that clustered together. Because the floors of the buildings do not quite match up, the school is divided into a labyrinth of hallways and stairwells nearly impossible for the uninitiated to navigate alone. The building looks like a brick fortress on a residential street lined with townhomes, across from a small park that hosts the school's soccer team in warmer weather, in a section of town framed by the neck of the river that snakes through the city. The neighborhood is well known for its Portuguese immigrant population and as one of the most vibrant, affluent parts of the city (although still working class by national standards), dotted with popular shops and restaurants. The neighborhood had been an industrial center for the city in the 19th and early 20th centuries, a legacy that lives on in its architecture.

Lincoln High School reflects the cultural and linguistic diversity of the neighborhood, with its student population speaking more than 25 different languages. The school serves about 1,250 students in grades nine through twelve. The majority of them are first- or second-generation Portuguese, Dominican, and Puerto Rican, with a smaller representation of students of African American background and from Central and South America. Nearly one-fifth of the student population is classified as special needs and a sixth is identified as "Limited English Proficient." Although the surrounding neighborhood is known within the city for its relative affluence, the school faces many of the same issues with which urban, high-poverty areas contend. The student mobility rate is more than twice the state average and the attendance rate lags behind the state average by 10 percent. These factors help explain why a full quarter of enrolled students do not

graduate, although dropout, student mobility, and absentee rates at other area schools are much higher (data retrieved from the State School Accountability Report Card, 2010).

Leadership. The principal of Lincoln High School—who himself was a Lincoln alumnus—had reached out to the lead faculty of the secondary level NUTR to express his interest in pursuing a partnership when the program was announced. By the time data were collected for this study the program was in its third year at the school and continued to enjoy the principal's whole-hearted support. He hired the first three NUTR graduates as well as three graduates from the second cohort, including Mauro. The principal was committed to teaching math and science through inquiry and expressed his belief that the NUTR was the best way to bring such teaching to his school. However, he also faced tensions between his progressive educational inclinations and district pressure to raise the students' test scores since the school had not met state-set benchmarks for student achievement in math and language arts the previous year and the new superintendent was emphasizing data-driven instruction.

Because the principal was responsible for the operations of a very large high school, he had little impact on the day-to-day activities of the NUTR teachers, including Mauro. The administrative pressure Mauro felt came mainly from his department chair, whose responsibilities for data collection had become more pressing and time-consuming. This pressure spilled over to the science teachers, who were expected to maintain "data walls" that tracked student progress as a whole and also chart the progress of individual students.

Supports. As a new teacher, Mauro was assigned a school-based mentor, a physics teacher in his third year of teaching. The mentor's role was to observe Mauro teaching and meet with him on a weekly basis during the first five months of school. Although fairly inexperienced, the teacher had become a residency mentor with the NUTR in his second year of teaching because the NUTR faculty collectively believed his teaching to be high quality. The teacher was asked by NUTR faculty to serve as Mauro's mentor because he had in-depth knowledge of NUTR preservice learning and no other earth or environmental science teachers were available (Mauro's preservice mentor had left the school by the time I began collecting data for this study). As a relatively new teacher, Mauro's mentor helped him make sense of his own first-year teaching experience. Mauro commented, "…At least within the school itself, he's easily the person who is closest to being a first-year teacher that can remember and reflect on how it went for them, and just how I should feel about how I've been doing." Mauro also thought his school-based mentor had helped him develop skills for applying his preservice learning in his daily teaching, providing "functional strategies to improve [student] learning." As Mauro reported, during weekly meetings he would discuss with his mentor "…strategies that worked for [the mentor], why they worked for him, and why they work [generally]."

Beyond the support provided by his school-based mentor, Mauro received another layer of assistance from the NUTR during his first year of teaching. As part of the partnership agreement between the district and university, both Mauro and his school-based mentor worked with a NUTR program coach, whose role was to provide coaching

for both Mauro and his mentor. Primarily, the coach was responsible for observing Mauro teaching and offer feedback on his practices. Secondarily, the induction coach observed meetings between Mauro and his school-based mentor. Based on those observations, she provided the mentor assistance on how to coach Mauro. In the final interview I conducted with Mauro, he reflected that his induction coach, a retired teacher and administrator from his district, had been "helpful, and not [helpful], at the same time." He considered her extensive teaching experience beneficial, noting that her knowledge of the district and administration had aided him in navigating the bureaucracy of his department and school and in prioritizing his responsibilities: "As first-year teachers, we are inundated with so much, and you need to realize what you *have* to do, and what other people should be doing and are putting on you, and I think she's been good for that." However, Mauro suspected his induction coach held back some of her thoughts about his teaching. Mauro worried that the information she withheld might keep him from seeing his practice from different angles, inadvertently slowing down his professional growth. Describing this tension, he commented,

> I think what is problematic…is fully knowing what her opinions are on some things…I mean I could honestly care less if it were anybody, if they disagreed with me, because I don't take it personally, I just wish you told me everything you thought…so I guess it's this whole transparency bit, I want to hear the good and the bad, and I want to know why."

Collaboration. During Mauro's initial year of teaching, five of the 16 science teachers at Lincoln High School were NUTR graduates. Mauro explained that since he

did not have common planning time with the two resident graduates who taught biology or chemistry, he rarely saw them. However, he shared a preparation period with two other NUTR graduates with whom he was in regular contact. According to Mauro, a very close relationship with one of these two teachers was an important source of support for him. In interviews and debriefing sessions, Mauro often referred to reflections and "aha's" from their work together: "As [teacher] and I were just saying the other day…" or "[Teacher] and I have talked about this a lot." Because Mauro and his residency colleague taught two different preparations each, their planning period was different from that of the other five ninth grade environmental science teachers (four of whom were not NUTR graduates), who as a majority made decisions without their input. This situation caused some conflict because all seven environmental science teachers were expected to plan together, follow the same curriculum sequencing, meet the same target objectives, and administer common assessments. In describing how this tension affected his teaching, Mauro commented,

> [My NUTR colleague and I] got to the point where we thought we had decided to teach X, but this other group decided that "Y" is better, and we should go in order "Z" instead…it makes us have to, redirect our learning, redirect our teaching, which has been a pain.

When collaborating with the veteran earth and environmental science teachers, Mauro initially experienced conflict over pedagogy. Some of the veterans objected to the inquiry-based approach and other teaching ideas Mauro brought from his preservice learning and experience. As the school year unfolded, however, the science teachers

realized that to work together they needed to create room for different pedagogical approaches to coexist. As Mauro explained,

> I think people are getting better about, everyone's teaching their own way, but as long as we cover A though Z, we are fine. And I think everyone has been respectful, like, "OK, go ahead and teach that way, I've tried to convince you, but if you're not buying it…"

Mauro credited his ability to "stick… to [his] guns" regarding his use of inquiry-based teaching to the large number of NUTR graduates the principal had hired. As he noted, "I do think it's at least a little easier at Lincoln, with at least half of the science department being about [the NUTR pedagogical vision]." The significant number of teachers in the department who valued a common teaching philosophy, combined with the principal's support of inquiry-based teaching and the presence of the NUTR program of the school, provided a relatively supportive environment for enacting practices that differed from the historical norm of urban schools.

Classroom environment. Although enrollments had declined in recent years due to the expansion of charter schools in the district, Lincoln High School suffered from a shortage of space, making the sharing of classrooms common. Mauro split his time between two rooms on the fourth floor of the school, teaching one class in Classroom 1 and the other four in Classroom 2, where he had taught with his mentor the year before (during his residency). Classroom 1 was a horizontal rectangular shape, laid out with white square tables each accommodating four or five students. A table in the front served as the teacher's desk. The room came equipped with a smartboard, which plugged

directly into a laptop for displaying media and graphics, or for interacting with charts, tables, and visuals. In the back was a row of computers and a large glass aquarium that housed the bearded dragon that belonged to the main teacher with whom Mauro shared this classroom. The room had a distinct feel of physics, the primary subject of the main teacher in the room. Often the only indication that a subject other than physics was taught in this space was the objective written on the board labeled "Environmental Science."

Classroom 2, where Mauro taught his four other classes, was shared with another teacher. However, this space looked more like an earth/environmental science environment than Classroom 1. The space was elongated and narrow, and earth science posters and various content-related paraphernalia decorated two of the walls. On the back wall were two large shade-less windows that at times created a glare problem for students and also heated the room uncomfortably (with the exception of a few rooms, like the computer lab, the school had no air conditioning). On the third wall was an enormous calendar used to help the students keep track of assignments and upcoming quizzes or tests. In the front of the room was a long, narrow, black and slightly elevated lab table used for a desk. The room was set up with black lab tables that accommodated three students each, in six rows of two, extending to the back of the classroom. Each pair of tables was separated by a space that served a wide aisle, which Mauro sometimes used as a demonstration space. Mauro had full sets of textbooks and some laboratory equipment, but the science department as a whole had suffered from recent budget cuts, necessitating reductions in resource purchases.

School schedule. The official school day extended from 8:20 a.m. to 2:45 p.m. Because the school was designated as being in need of improvement by the state, school administrators created an A/B schedule for all classes other than mathematics and language arts. This meant that students would attend math and English classes daily, but received science instruction only every other day. On A days, Mauro taught two classes of eleventh grade earth science, and on B days he taught two classes of ninth grade environmental science and an eleventh grade earth science class. All classes were eighty-minute blocks of instruction. His last class of the day on B days was interrupted by lunch. Thus, the students would be dismissed for lunch at 1:15 p.m. return to class at 2:00 p.m. for an additional 45-minutes of instruction.

Students. As previously mentioned, Lincoln High School was very diverse, with high proportions of Spanish- and Portuguese-speaking students. Mauro's classes reflected this diversity and ranged in size from 16 to 30 students (due to student mobility the actual class enrollments fluctuated throughout the length of this study). Mauro's two ninth grade classes were his largest, each with approximately 30 students. In contrast, two of his earth science classes had fewer than 20 students and the third class did not reach 30. Within the school, earth and environmental science were "lower-track" classes, something all students were well aware of. Mauro commented:

> I think the groups that I teach tend to feel marginalized by the school, because they take sciences that are marginalized within the department, so…[the school officials say] "you need to complete science, so you have to take this one, because none of the other ones are you quote, unquote 'capable' for."

Mauro perceived many of his students as disengaged from school. He thought their disengagement partially stemmed from students not understanding the purpose of schooling, and thus he saw part of his work as "convincing them of the value of school." Echoing the message his family had communicated to him, Mauro told his students, "The most important part of school is just to create those opportunities for yourself, and if you don't like your position...(school) is, at least in terms of how the country is set up, your best way of advancing yourself." He reflected that the school did not effectively communicate this message to the students, and so he assumed full responsibility for engaging students in school as a way of helping them achieve economic success. He noted, "I need to reorient my teaching to… convey these like, really important adult messages to them consistently."

Mauro also described his two sets of students—his "freshmen" and "upperclassmen"—as bringing different qualities to their respective classes. His eleventh and twelfth grade upperclassmen were close to graduation, which Mauro felt translated into students attending more seriously to their studies. He also described his upperclassmen as mature in their interactions with each other and attitudes toward the class in general. He often commented on the "organic" and amiable collective demeanor of his upperclassmen and attributed this geniality and apparent maturity partially to their age and life experiences, noting, "They have also had more mature life experiences. I can even think of a couple of students that … have children."

In contrast, Mauro noted his ninth grade students' general immaturity relating to both social interactions and their classroom work. Mauro identified what he termed a

"gap" between the ninth-graders' sense of self-awareness and related classroom events. He felt his students tended to ignore their own personal role in classroom situations that affected them negatively, which he believed impaired their collective ability to function productively.

Discussing this "gap" in self-awareness, he explained,

> The freshmen will have this *major* gap between, 'this is what other people are doing wrong that affects me', 'this is what other people do right that affects me', and 'this I what I do right that affects me', but *not* 'this what I did wrong that affects me.'

Mauro believed his freshmen were challenged by the transition they were making from middle school to high school. In their new school setting, the academic and behavioral expectations were dramatically higher and the students were faced with navigating a complex new social and organizational environment. Mauro reported, "The expectations have skyrocketed between you know, middle school and high school, and whatever those expectations might look like, there's just more of them, and I think that's what's confusing to them."

Instructional content. Mauro taught three sections of eleventh and twelfth grade earth science and two sections of ninth grade environmental science. Because Mauro taught two different grades, I decided to observe a short earth science unit—for which Mauro had expressed a scheduling preference–and extend the "mini" unit observation with the environmental science classes. This schedule allowed me to spend close to equal time with each of Mauro's two subject areas. The earth science unit, which addressed

continental drift and plate tectonics, lasted five 80-minute periods (not including the summative assessment). The main topics studied were the theory of continental drift and supporting evidence, the formation of rocks and seafloor spreading, calculating rates of seafloor spreading using map data, and the process of plate tectonics. The fifth class session was devoted to a review. After the earth science unit, I observed four ninth grade lessons, approximately one half of a unit focused on evolution. The topics in that unit included an introduction to the theory of evolution, environmental adaptation, interactions and symbiotic relationships between species, and biodiversity. (Details regarding the content of the lessons observed can be found in Appendix A.)

Mauro's Teaching

One of the most striking findings in Mauro's case was marked differences in the functioning of his earth and environmental science classes. Cognizant of these differences, Mauro tended to "dichotomize" the classes, often commenting on dissimilarities he noted in students' behavior and orientation to learning. He described "upperclassmen" in the earth science classes as relatively calm and receptive to student-centered and active learning experiences. In contrast, he saw "freshmen" in the environmental science classes as somewhat resistant to higher-level learning activities, and instead "just want[ing] the answers." As Mauro put it in an early interview:

> Whether I am teaching a first year or an upper year class…[there are] big differences in… the expectations and the levels of resistance and willingness to do more work or …if they don't do more work, just accepting the consequences

better. So I think that the upperclassmen have more developed decision-making skills and adult skills, compared to the first years.

Since the upperclassmen and freshmen acted with each other and responded to Mauro's teaching differently, I decided to examine his day-to-day practices with each group separately. The two accounts that follow show Mauro's attempts to enact teaching practices learned in the NUTR program (e.g., problem posing and experiential learning) within the context of the particular subject matter he was teaching, to a particular set of students, in a particular classroom setting. The analysis shows that such enactment depended on the willingness of students in the class to cooperate with instructional activities Mauro had created for them, something he needed to negotiate or work out with the students continuously. Through those negotiations, Mauro and the students co-constructed his teaching practices as well as his sense of identity as a teacher.

Teaching Earth Science to Upperclassmen

The analysis of Mauro's earth science teaching to upperclassmen is developed in three parts. I first examine Mauro's day-to-day teaching, showing which particular practices from his NUTR learning he was able to fit into this particular setting. I then examine how those practices were negotiated with the students. Last, I discuss Mauro's development of his sense of self as an earth science teacher.

Enacting practices learned during preservice preparation. Mauro was able to apply several elements of his preservice learning in teaching, five of which were noted with frequency in the data collected for this study—problem-posing, experiential learning

opportunities, linking student and content knowledge, explicitly teaching inquiry-based scientific skills and terminology, and differentiating learning.

Problem-posing. Rather than using inquiry-based labs and projects, as the NUTR program had emphasized, Mauro folded inquiry into each lesson mainly through modified problem-posing, offering the class open-ended questions that asked students to consider the how and/or why of phenomena. The "do-now," or the warm-up activity, often featured a "how" or "why" question that asked learners to theorize about a topic related to the day's lesson. For example, when Mauro began his unit on continental drift, he opened it by projecting a map of the world and posing the question, "How do you think the continents got their shape?" Later in the same lesson, the class watched a video that presented information about Wegner's theory of continental drift, which at first was not accepted by the science community. "So the focus is on *why*," Mauro told his class. "[Wegner] saw something and it made sense, but he wasn't explaining why…and in the science world, you need a 'why'."

Experiential opportunities for learning. Although his earth science lessons were not characterized by full-period labs or student-led projects—teaching strategies for which faculty in the NUTR had advocated—Mauro did incorporate elements of experiential, hands-on learning in his teaching. These included structured group activities and demonstrations led by Mauro and sometimes also involving student volunteers. An introductory activity prefacing Mauro's introduction of the concept of seafloor spreading provides an example. To give a visualization of the process of rock formation, Mauro performed a demonstration that illustrated to students how salt, once

dissolved into hot water, crystallized upon immersion into ice water. Although teacher-led (another modification from his preservice learning, which stressed creating student-directed opportunities for learning), the demonstration was interactive—asking students to observe, hypothesize, and theorize about the outcome. In another instance, after the class analyzed a scenario that asked students to predict what would happen if a car was traveling across mud and crossed to the cement, he asked for two volunteers to demonstrate the idea. Each student pretended to be a front wheel of the car in the scenario and held a meter stick between them to serve as the car's axle. He then invited the rest of the class to call out what would happen when the car met the concrete, and the student volunteers acted out the predictions.

Linking student knowledge and content. Mauro attempted to explicitly link the earth science content and students' lives, a repeated trend in his observation scripts. He considered this strategy a way to engage his students in science, which Mauro hoped would counter the influence of the learners' low-track science status. He explained, "It guides my instruction that I know [the students] don't …'care' about science, because the school tells them they shouldn't care about it." To bridge between students' knowledge and content, he often provided analogies grounded in familiar topics. During a lesson on density, Mauro asked, "Do any of you watch American football?" At the students' nods, he asked them to imagine a tackle pile at a football game, and asked: "The person squished at the bottom, they would still have the same number of atoms in their body, right? They would just be squished into a smaller space." Likewise, to help students understand the concept of seafloor spreading, he invoked jenga, a game in which players

attempt to balance a tower of wooden blocks. “What happens when you are playing jenga and you keep building it higher and higher?”

Developing skills and language of scientific inquiry. Beyond connecting new content to familiar concepts, Mauro aimed to help his students develop the skills of scientific inquiry and the corresponding terminology. During activities, Mauro emphasized the processes of the scientific method, often asking students to observe, hypothesize, revisit and reconsider their previous thinking, and synthesize pieces of evidence to form a conclusion, just as a scientist would do. For instance, while introducing a lesson on density, Mauro stacked a pile of textbooks and asked the students to observe and hypothesize, “What is true about both the top and the bottom book? What do you think the atoms will look like in the top and the bottom book? Draw a picture that shows what you think.” Similarly, as Mauro led a demonstration of the process of crystallization, he asked students to predict what would happen to the test tube filled with a salt-water solution if he submerged it in ice water. Students offered several ideas: “It will explode!” “It will evaporate!” “It will turn hard!” Mauro then asked students to make observations of the solution as he walked around to each table, showing that the solution was becoming cloudy and crystals of salt were starting to form. Students yelled out their thoughts: “It’s little balls of salt.” “It’s turning hard.” “It’s like a ball of ice.”

Mauro also emphasized building scientific language alongside such skills. Although he wanted to avoid “giving forty words they have to spit back,” he nevertheless felt that students required some facility with certain scientific vocabulary because “they need to be able to articulate like a scientist.” During lessons, Mauro scaffolded scientific

language use, validating students when they used appropriate terminology. For example, as he set up the salt-crystal demonstration noted above, Mauro held up a clear glass tube and beaker and asked the class, “What do I have here?” Students called out, “A test tube!” “A beaker!” Mauro replied, “Yes, good terms!”

In other instances, Mauro helped students connect their prior knowledge and experiences with scientific vocabulary, acknowledging these knowledge and experiences and helping them understand that scientific terms are just a particular kind of capital. As students answered review questions during the continental drift unit, one student described the process of seafloor spreading. “So the lava comes up, and rocks are piling up and going over the side…” Mauro asked, “So what is that process called?” The student could not produce the answer, so the two of them looked it up in the book together. “Seafloor spreading,” the student identified. “See, you knew exactly what went into it,” Mauro said. “You just needed to get the vocabulary.”

Differentiating instruction. Mauro had spent his residency year with a mentor who taught inclusion to students in the eleventh grade earth science classes, an experience he felt had helped him develop the ability to differentiate instruction for a wide range of learners and needs. From that experience, Mauro concluded, “…the best instruction comes from small group and one-on-one.” As he explained it, “… When I construct lessons, I feel this pressure to make it, if possible, … multi-task, where students can self-identify pace… as long as minimum goals are met, that’s … sufficient for me.” His classroom activities often contained such opportunities for students to “self-identify” their learning paths. This strategy is illustrated by a seafloor spreading activity Mauro

purposely designed to account for varying levels of comfort with the mathematic concept of proportions, which students needed for their calculations. Presenting a divided worksheet to the class, he explained to students that one side was a review for those who felt they needed more practice with the math before applying the skill to calculating distance. Students who were comfortable with proportions, however, could start with the activity on the other side of the worksheet, which featured mapping exercises for students to employ their knowledge to calculate seafloor-spreading rates.

Mauro also differentiated his teaching to address the difficulties he faced transitioning from the co-teaching model he had experienced the year before as part of his residency to "being the only person in the room" responsible for addressing the needs of students and providing assistance to those requiring extra help. Because he was the only adult teacher in the classroom, Mauro often included in his lessons individual, paired, or small group activities in which students supported each other during assignments while he circulated the room. During this time he checked in with students individually or as a small group, asking probing questions and working with those who needed more or different scaffolding. He thought this kind of activity allowed students to "go at their own pace…create their own story." Some of the collaborative activities were short theorizing breaks within a larger activity, such as a task where Mauro provided a graphic of underwater volcanic activity and asked students to theorize in pairs about what happened to the rocks that were produced underneath the ocean over time. Others spanned longer periods, such as a review activity that provided a set of essential questions for the unit. Mauro asked students to work in small groups for the entire period,

while he checked in with each group and concentrated his time working more intensively with students who needed additional help or had been absent during the unit.

The five practices described above—problem-posing, experiential learning opportunities, linking student and content knowledge, explicitly teaching inquiry-based scientific skills and terminology, and differentiating learning—were prominent elements in the teaching repertoire developed by the NUTR. However, they do not encompass the entire pedagogical vision of the program. For example, I never observed Mauro using student-driven experiential learning activities, an emphasis of the UTR pedagogy. Mauro reported that because of time constraints, teacher-led demonstrations were a more practical instructional alternative. Moreover, in applying practices from his preservice learning, Mauro needed to adapt each to the particular students in his classes, something accomplished through various negotiating strategies. Those negotiations, which are detailed below, provide a window into the challenging process of learning to teach in the early phase of a teacher's career.

Negotiating with students. The teaching practices discussed above are presented mostly in a linear fashion, with Mauro seeming to be the sole "doer." The analysis that follows shows, however, they were the products of Mauro's ongoing negotiations with his upperclassmen. As such, they were co-constructed by Mauro and his students. This is not to suggest that Mauro and his students played an equal role in the teaching I observed in the earth science lessons. Rather, his teaching depended on the willingness of students to go along or cooperate with the learning opportunities Mauro created for them. Such cooperation was most critical in the more learner-centered instructional activities.

In his day-to-day teaching, Mauro used several strategies, both direct and indirect, to get students to "buy in(to)" lessons or to secure their participation in particular activities. The direct strategy Mauro use most frequently involved refocusing students by asking them questions about their progress or about the content in the activity as he circulated between pairs or trios of learners. During the collaborative assignments or activities that comprised the bulk of his lessons, Mauro frequently "checked in" with students who were working independently, gently guiding those who may have been slow to begin the assignment, unclear about expectations, or otherwise "off-task." For example, during a lesson on seafloor spreading, Mauro had asked students to work with a partner to theorize about the process of underwater rock creation. Within a moment or two, about half the class was engaged in writing. Others seemed to be thinking about the problem, apparently having trouble coming up with something to write, or otherwise off-task (talking to their neighbor, playing with their cell phone or ipod, and so on). Mauro began to make his way around the room, stopping by two students who were chatting. Rather than emphasizing the unwanted behavior, Mauro used his physical presence, squatting down next to the table in close proximity to the students and directly asked, "OK, gentlemen, what are you thinking?" The students responded positively to Mauro's action, turning to their work and offering their thoughts on the question their teacher had posed.

Mauro worked on developing relationships with his students, another strategy that indirectly facilitated his ability to negotiate their involvement in learning activities. Two of the methods he used to actively build student-teacher connections were transparency

and “side conversations.” Mauro considered himself “transparent” about providing rationales for activities and decisions that affected the students. He reasoned that by making his thinking explicit and helping students understand the logic undergirding lesson activities and instructional decisions, they would be more likely to understand his purposes and thus participate in or cooperate with the lesson. For example, when Mauro moved up the test date for the continental drift/spread unit by one day, he explained to students that he had changed the date because the A/B schedule meant that too much time would pass between the review and the test date. As Mauro explained to the class: “The test for this chapter is slightly moved up...I did it because I didn’t want you to have the review on Thursday and then have to take the test on Monday.” Beyond serving an informative function, this statement also demonstrated to the students that Mauro was invested in their achievement. That is, if too much time elapsed between the review and the assessment, students were at risk of forgetting the instructional content, something that could potentially interfere with their ability to do well in the test. Similarly, in another situation when a student asked to go to the rest room during a lesson, Mauro responded, “Not right now. I want to give directions and get you started first, and then you can go.” By explaining his thinking in these two instances, Mauro communicated his investment in his students’ academic success, which helped build a community of respect and caring in his earth science classes.

Yet another reason for transparency, Mauro shared, was to ensure that students had all the information needed to be not only successful but also accountable in his class. For instance, homework completion was a common problem in the school, and the

science department mandated that 10 percent of students' grades go to homework. To help his students in this area, Mauro kept a Twitter account, tweeting homework every night. He also kept a running log of his homework assignments, telling students, "All the information is up there [on the board], a description of all the homework, and who is missing what. So I am trying to be as transparent upfront with you."

A second method Mauro used to establish relationships with students involved what Mauro called "side conversations." These were short, divergent discussions in which students shared personal stories that often had some connection to the instructional content being studied. Mauro shared, "They make themselves open to conversations…we take the opportunity to get to know each other and then we go back to doing work." Sometimes these were "enriching tangential conversations related to the [instructional] topic," such as a side discussion about the tension between religion and science resulting from a lesson on the Big Bang Theory. However, even if the conversation was not germane to the immediate topic at hand, Mauro still encouraged his students to speak their minds in class. He explained:

> Even if it doesn't have to do with science, I just like those opportunities where people can share thoughts, just show that other people can have thoughts that aren't yours, and how can we go about having a conversation where people don't agree with you.

Mauro's respect for students' voices was apparent, a factor that may have contributed to the comfort level they experienced in the class. For example, when Mauro introduced a part of his lesson on density that dealt with a scenario of a car, he prefaced

the problem with, “Does anyone here drive?” A student called out that he had just gotten his driver’s license, and Mauro paused to congratulate him. The student recapped his experience for the class, and Mauro then refocused them on the scenario. Mauro felt that this ability to have a “side conversation” and return to the task at hand was a successful strategy: “With the upperclassmen, it’s easier for me to have side conversations…. even if they are off-task, engage them in that conversation for a moment, and then they will be good.” Rather than avoiding such breaks from planned instruction, Mauro actually pursued them with students, but only momentarily. He would then return to the established lesson objectives and keep students to a schedule. Following Mauro’s lead, the students would also return to the activity, collaborating with their teacher and in the process co-constructing the instructional event with him just as he collaborated with them in their side conversations.

Building relationships and creating a comfortable classroom environment meant Mauro was able to work out social norms with the students that facilitated the smooth functioning of the class, allowing him to enact elements of the practices he had learned in his preservice teacher education program. In speaking about those norms, Mauro commented: “[The students] know I have expectations, they know what behaviors are appropriate and what aren’t, and they know I’m pretty lenient as long as things get done.” This helped create an environment he called “casual” and “authentic,” where students often chatted with each other while completing their assignments. Mauro had no problem with this “multitasking. As he put it, “[The students] have this awesome peculiarity…they are very chatty, but they will also do their work at the end of the day.”

Thus, the teacher's willingness to allow talking and multitasking in class, coupled with the students' willingness to produce the required work, created a comfortable, "low stress" environment that proved productive for all involved—the students engaged actively in learning activities and Mauro enacted, although in modified ways, practices he had learned during his preservice preparation in the NUTR program.

Although the eleventh grade earth science lessons functioned productively as a whole, differences existed across Mauro's three earth science classes. The data show that sometimes students in the different classes responded in various ways to the same lesson or teaching strategy, adding an element of unpredictability to his teaching. When I observed Mauro's earth science (A day), second period class (his smallest class, with a total of 16 students), the students were highly engaged in the discussion. They continuously fired content-related questions at Mauro, which he used to drive the lesson forward, thereby building on the students' particular interests. In the debriefing session, he shared,

> They are like naturally curious…I've told them, I don't care what questions you ask. I've really emphasized that, and…with this class I've been able to communicate it best. And I don't know why, so if you are going to ask why, I don't know entirely what it is about this class (laughter). It might be the size.

The classes also differed relative to the range of students' skills. I arrived early one day for an observation and caught Mauro in between two of his eleventh grade classes. He was flustered, he told me, because he had "made assumptions" about the students' knowledge of mathematics, designing an activity that required an understanding

of proportions. To his surprise, many of the students had not been able to complete the task, which led to frustration and resistance from the class. In the next lesson, his second period, the lesson went fairly smoothly, with Mauro able to work one-on-one with the students who seemed to have the most difficulty with the activity. When I asked him in the debriefing session about the difference I had noticed between the two classes, he commented that because the second class had a stronger math foundation, the students were more willing to engage in learning.

> I think [my second class] came with a little more of a background knowledge, not all of them did obviously, but I think in terms of math skills this class was just stronger than the other, on top of it, even familiarity with the language, to just familiarity with the concept, which I think aided them a lot more. And I think too a willingness to try more…compared to my other class.

Developing Teacher Identity. In the process of negotiating his practice with students, Mauro also developed a sense of teacher-self distinct to his earth science classes. Such development was intricately connected to the ways he and his students interacted and the practices constructed through those interactions. With his upperclassmen, Mauro felt he could be more "himself." He explained that his earth science classes, in general, "respond the best to my, I mean of the few personas I adopt when I teach, this is probably my most natural one, my most casual one." The relative absence of conflict in this class, an environment Mauro had co-constructed with his students, enabled him to teach in ways that were fluid and open-ended. Because he was reasonably certain his earth science students would respond favorably to his teaching, he was comfortable engaging in

momentary tangential conversations with them addressing and folding their questions into lessons, and modifying activities on the spur of the moment. These processes helped to build Mauro's relationships with students, further enabling him to act in ways that were consistent with his teaching vision—a pedagogy grounded in inquiry processes and scientific literacy. The productive functioning of these classes also gave Mauro a personal feeling of success as a teacher. Describing this sense of accomplishment, Mauro remarked in a mid-October debriefing session, "I'm always much happier with my earth [science classes]." These conditions enabled Mauro to develop a teacher identity within his earth science classes that was satisfying to him and seemed to match his aspirations or ideas about the kind of teacher he wanted to be.

Seeing self as easy going with high standards. Mauro saw himself as a teacher who was "easy going, but with high standards." He demonstrated this "easy-going" attitude and approach to his students in responses to classroom occurrences, such as the way he reacted to a "cheating" incident during a lesson about continental drift. Mauro had a PowerPoint slide projected onto the board with the instructions for the particular activity, which tasked students with using scientific evidence, such as fossils, to match the seven current-day continents with their original Pangaean shape. As students worked in pairs, Mauro crouched with his back to the board, working with two students. Suddenly, a student called out, "Hey! He cheated!" Mauro spun around to see that another student had gone behind his desk and moved the PowerPoint presentation ahead to the next slide, which meant the student had also handled Mauro's laptop. The next slide revealed the placement of all the continents, which the students saw as the "answer"

to the activity. A range of "normal" teacher responses the students may have expected (and I expected as well) might have included negative reactions to the student for revealing the answer, for handling the teacher's laptop, or for being out of seat without permission. However, Mauro simply laughed and said, with obvious good humor, "I turn my back and the whole world changes!" He walked to the front of the room, switched the PowerPoint back to the previous slide, and then resumed his work with the students whom he had been assisting before the incident. In our debriefing session after the class, I asked him to describe the thinking behind his response. Mauro shrugged, explaining that he had not been bothered because the "answer," as the students saw it, was not the point of the activity. He further noted, "I think I always see 'the answer' as being meaningless unless they can explain it. They could say, '[The continents] line up,' and I would say, 'Well, what does that mean, though?'" This event clearly illustrates the combination of high expectations and easy-going attitude Mauro possessed. By not reacting negatively to the student who had handled his laptop to move th e PowerPoint slide, Mauro demonstrated trust of students with his belongings. His response to the "cheating" also showed his high expectations—Mauro did not aim for his students to merely provide "an answer," but considered true learning to be the explanation, or the "why," that accompanied the answer.

Commitment to change agency. Mauro's scaffolding and support for students in his aim to hold them to high academic standards also demonstrates his development as a teacher committed to change agency. Entrenched educational practices in urban schools tend to position students as passive receivers of knowledge, and actively participating in

kinds of instruction that requires theorizing and other high-level thinking is risky for students who are new or relatively unused to such pedagogies (Cohen, 1988; Walqui, 2006). To build his students' confidence with their thinking, and in so doing move them to higher rates of participation in learner-centered instruction, Mauro provided numerous forms of validation and support. He created low-risk theorizing opportunities, where students discussed their thoughts in small groups, rather than being individually accountable. As previously mentioned, he stressed the process of thinking over cognitive products, praising and rewarding effort, no matter the outcome. Mauro also made sure to recognize student thinking throughout his lessons, constantly congratulating students with a quick comment, such as "Great thoughts here!" Over time, students developed more confidence in their critical thinking and scientific inquiry skills. This not only contributed to students' academic engagement, but also provided students who had been placed in a "low-track" by their school an opportunity to feel successful. For example, after Mauro listened to a student's thoughts about seafloor spreading and nodded his approval, the student exclaimed happily, "I'm a GENIUS!"

Seeing self as a "human" teacher. Another key facet of Mauro's teacher identity development in his earth science classes was his effort to embody a "human" teacher. He wanted to show his students that he was not just "a teacher," but also a person—someone to whom students could relate, a person who was fallible. Mauro described,

> I just really want them to see me as human—that I have my strengths, and I have my faults, and I have moments where I make mistakes, but as long as I acknowledge those mistakes and try to correct them, and explain how I correct

> them…that's all I really want. Teachers aren't perfect…I think it really needs to be an emphasis—you can relate to your teacher, in terms of being someone who makes mistakes like you.

Mauro acknowledged that his youth was a point in his favor because it helped the students identify with him. On one Friday—when the faculty was allowed to dress in a more casual manner—Mauro wore his new sneakers to school. Taking notice of his footwear, a popular brand many students wore, a student exclaimed, "Mr. G, you wear Airforces?!" Mauro also casually referenced his life outside of the classroom. When a student had difficulty with his last name, the student queried, "Can I call you Mr. G?" Mauro replied, "Sure, that's what they call me at Starbucks! I go there so often they know me!" The students laughed, sharing in the joke of their teacher's coffee habit.

These instances of connection, in addition to Mauro's efforts to be honest and transparent with his students, helped him to construct a teacher identity with his students that pushed beyond the one-dimensional view of "science teacher" and instead became a multi-faceted individual—not just someone who taught science content, but a real person with strengths and weaknesses, who drank too much coffee and liked the same sneakers as they did. As a whole, Mauro's upperclassmen responded positively to the identity Mauro was developing—an easy-going, caring, relatable teacher who also held his students to high standards. The students' positive responses to his classroom actions, and a reciprocal willingness to accept his authenticity and see him both as a teacher and a human being—not just as an authority figure—contributed to Mauro's development of a teaching-self specific to his earth science classes.

Teaching Environmental Science to Freshmen

While Mauro taught environmental science to freshmen in the same school setting and with the same supports he had for teaching earth science, his ability to teach this second subject in the socially just ways learned in the NUTR program and to negotiate his practice with students differed substantially. Even though Mauro's practices in environmental science tended to be more teacher-centered and featured more whole-class instruction than was evident in his earth science classes, some elements of his preservice learning were also present. Alongside the practices that were co-constructed with his ninth graders, Mauro also began to develop a different teacher "persona" than the one described above, as the data presented and analyzed below show.

Enacting practices learned during preservice preparation. In Mauro's ninth grade environmental science classes, the lessons I observed were mainly teacher-led with relatively few opportunities for students to experience hands-on learning. Despite this outcome, Mauro worked diligently to apply elements of his NUTR learning when teaching environmental science. Most evident in my observations was the use of experiential learning opportunities, opportunities for theorizing about phenomena, linking student knowledge to academic content, scaffolding academic processes, and explicitly teaching critical thinking processes. Mauro's enactment of these practices is detailed next.

Experiential opportunities for learning. Experiential learning opportunities require students to engage with each other, the teacher, and the content of instruction in ways that differ from the more typical lecture method used in urban schools (Haberman,

1995/2010), which tends to have a uni-directional flow of information from teacher to student and places learners in a passive role of receiving information. Because experiential learning demands active student participation, if they decline to engage in planned activities their learning is compromised. Unfortunately, since Mauro's ninth grade students did not consistently cooperate with planned experiential activities, he had difficulty enacting this practice in his environmental science classes as he had learned it in the NUTR program. The following activity illustrates the problem resulting from lack of student cooperation in planned experiential learning tasks. In the beginning of a lesson on evolution, Mauro passed out a tub of candy with multiple varieties, asking students to take two pieces each. His plan was to use the leftover candy as an analogy for introducing the notion that to survive over time, species must adapt to their environment. Mauro's reasoning was that if each student took two pieces of candy, the leftover pieces would be the varieties that were least appealing to students. He explained afterward that he planned to tell the students that they were the "predators" and ask them to imagine what the leftover candy would look like if they reproduced. He hoped to link this experience to the idea that over time, species develop characteristics that protect them from predators. However, rather than taking only the two pieces of candy Mauro had specified, some students instead took several. This left Mauro without enough pieces of candy left to make the analogy, and prompted him to tell the students they had "destroyed" his "teachable moment." As this example suggests, student-centered teaching, including the use of experiential learning, is risky for teachers. In this case, Mauro counted on students to follow directions in order to achieve his goals. When the students' actions did

not comply with his plan, the enactment of an experiential learning opportunity was compromised.

Given the unpredictable behavior of his freshmen, Mauro adapted a strategy of modifying his instructional plans mid-lesson if he felt the students were not likely to participate "appropriately" in activities that required some autonomy. For instance, during a particularly rowdy class on biodiversity, Mauro needed to stop the class multiple times to refocus students on the material at hand. When it came time for an activity that required students to get up from their seats and move around to participate in a group activity, Mauro worried they would become even more rambunctious. As a result, he opted for modifying the task on the spot, posing a set of questions to the entire class rather than having the students do the planned group work.

In general, while Mauro's teaching of his ninth grade classes was somewhat interactive and question-rich, it tended to be teacher-led and tightly structured in response to the nature of students in those classes. A lesson on organism relationships—ways organisms interact with each other in a particular environment—provides an illustration. To support students' understanding of five different types of relationships between organisms, Mauro constructed a three-page graphic organizer. The first page featured a three-column chart, the first column of which provided space for students to record the scientific term, such as predation (a predatory relationship) or symbiosis (a relationship in which both organisms benefit in some way). The second chart column included space to write a short definition for each relationship. Because Mauro anticipated that students might have difficulty making sense of these relationships, he also included a third column

of two “emoticons” (a smiley face, straight face, or sad face) which students could use to denote the nature of the relationship. A predatory relationship, for example, would require students to draw one happy and one sad face, because one party of the relationship benefitted while the other did not. Mauro led the class through the first two parts of the activity. He first gave a short definition for each type of relationship, and then asked students which emoticon they would assign to each animal in the relationship. In subsequent sections of the organizer, Mauro guided students through a set of clips that demonstrated different types of organism relationships, with students responsible for determining the type. The last part of the activity asked students to independently read scenarios and identified the relationship based on descriptions given. As this description suggests, the overarching structure of the lesson was fairly traditional, with the teacher first providing information, then guiding students in using the information, and finally having students practice using the information on their own. At the same time, however, this particular lesson also incorporated emoticons, an element of popular culture familiar to the students, which became a tool for meaning making.

Theorizing. While hands-on learning activities were limited in his environmental science class, Mauro’s lessons were often structured around opportunities for students to theorize about the particular topic for the day. It was not unusual for Mauro to interrupt a note-taking activity with a request for students to respond in writing to a particular question related to a new concept being studied. For example, after providing a basic definition of biodiversity in one lesson, Mauro asked the class, “So now what I want you to think about…why is it helpful that there are places in the world … with a lot of living

things? I want you to take two minutes, work silently, and write down and brainstorm your ideas. Why is biodiversity important?"

During teacher-led activities, Mauro also used open-ended questioning as a technique to avoid straight lecturing. In a lesson on ways animals have evolved in relation to their environment over time, rather than lecturing the class, Mauro used a PowerPoint presentation to outline major content points, each of which was accompanied by a photo or embedded video clip he thought would appeal to the students. One slide featured a still shot close-up of a green chameleon. After giving time for students to brainstorm answers to the question, "What characteristics do you think helps the chameleon to hunt?" and discussing some of the possible answers, Mauro clicked the slide. Students exclaimed in surprise as the frozen photo came to life, with the chameleon's eyes darting around independently of one another. A student called out, "Oh, that's so cool, but gross at the same time!" Mauro asked the class, "OK, so why would this be helpful?" This strategy provided a teacher-led, yet interactive and engaging, way of taking notes that incorporated some aspects of inquiry but stopped short of an extended discussion or other collaborative practices.

Linking student knowledge to academic content. Sometimes Mauro helped students make connections between their personal knowledge and environmental science content, a practice emphasized in his preservice program. For example, to introduce the idea of niches in environmental science, Mauro asked students to describe their "niche" in their community—that is, to explain where and how they fit in the community. Similarly, to broach the topic of objectivity and specificity in scientific procedures,

Mauro began by asking students to write down all of the steps in making a peanut butter and jelly sandwich. After students had constructed their lists, he brought out a loaf of bread, a jar of peanut butter, a jar of jelly, and a plastic knife, asking them to collectively talk him through the process. "Take a piece of bread…" a student began. Mauro picked up the bag and poked at it, showing he was unable to get the bread through the bag. Students soon realized how detailed and specific they needed to be in writing the steps. Building on this understanding, Mauro moved the students into a second activity that would demonstrate the importance of specificity for replicating procedures in science. By first grounding concepts in student knowledge, Mauro was able to "move from the concrete to the abstract" and also help students make direct connections between lives and schoolwork.

Supporting student learning. Mauro also provided supportive scaffolds for students to move them from lower- to higher-level academic tasks, such as using textual evidence to support claims. During the evolution unit, one class focused on the adaptation of animals to their environment. Mauro began by introducing the idea of adaptation, providing descriptions of animals and the ways they adapted to their environments. He asked students to use their own knowledge and reasoning to theorize about the function of each adaptation, given certain information. One example included a snow fox that lives on the tundra in the Arctic. He asked students to theorize what the function of its adaptation (a white coat) might be. From this activity, which students completed with relative ease, Mauro moved to a second task requiring students to read a textbook passage about animals and plants in the African savannah, using evidence from

the text to identify an example of an animal, a related environmental adaptation, and its function. This second activity mirrored the first, but involved a more complex skill set. After guiding the students through a shared read of the four-paragraph textbook passage, Mauro quickly drew a three-column chart on the board, labeling the columns 1) Animal, 2) Adaptation, and 3) Function. He elicited student volunteers to help him model for students, and then asked them to independently complete the chart by finding three more examples from their text.

Developing critical thinking. Critical thinking processes were another kind of cultural capital Mauro wanted to help his students develop. He reported, "One of my key goals is … can you be a critical thinker, and what is critical thinking, and how can we achieve it…the first thing I want to focus on is, 'Can you defend your thought well?'" Mauro believed that his ninth graders had been conditioned to be passive learners, reporting that when faced with activities requiring them to make sense of ideas, many "shut down." He speculated that the students responded in this manner because they felt unsuccessful or vulnerable during such exercises. To engage students in active learning activities, Mauro sought to help them gain confidence in their own thinking processes. He noted, "I have to do more to convince them of why their thoughts are valuable… I'm really pushing them to realize that it's OK for them to think, and the other part is that it's ok for them to be wrong." Mauro aimed to create a "low-stress" classroom environment where students would feel comfortable voicing their opinions. He often referred to students' thinking in his elicitation of student talk, asking, "So what were some of you thinking?" or remarking, "I'd like to hear your thoughts on this."

To support his assertions regarding the importance of thinking critically, Mauro adjusted his grading system, giving some weight to "caring and making attempts," not just giving the "right" answers. He explained, "It's ok if you are wrong, [as long as] you are making attempts to figure this out." He also reminded students often to pay attention to their thinking process (how they arrived at an answer), not just to focus on the answer itself. For example, in one class, a student balked at attempting the lesson's opening activity. Mauro prompted her by saying, "Try to explain it in however many words you can." "But I don't know if I have the right words," the student replied. "Don't worry," he assured her, "the focus isn't on getting it right."

Negotiating with students. Mauro's social negotiations with his freshmen were more challenging than those with his upperclassmen, complicating the day-to-day work of enacting the practices learned in his preservice program. A gap seemed to exist between Mauro's expectations of the students and what many of them were willing to do. Mauro did not believe that he had overly harsh behavioral expectations for students, but he wanted them to abide by what he considered basic social norms. Reflecting on the classroom expectations he had attempted to communicate to his students, Mauro commented,

> I've had many conversations about, 'It's really not OK to do this, this, and this, in a class. It's just not OK, and these are the reasons why. But even then, the reasons aren't good enough. Like, it's not appropriate to hit each other…I don't know how to communicate to them otherwise, that these are things that are really

> valuable skills to have, everything from just respecting when someone is talking to…I think the big one is just respecting who is talking and respecting your peers.

Despite multiple discussions about the classroom norms Mauro expected the class to follow, the students made little progress over the course of the five months of data collection toward meeting his behavioral expectations as a whole. While he partially attributed the dysfunction in the environmental science classes to students' lack of maturity and sense of personal responsibility, Mauro also blamed himself for being unable to convince the class to adopt classroom behaviors he considered. Reflecting on his own role in the dynamics of the classroom, Mauro commented, "I'm not very good at communicating to them (pause) what's so improper. I mean I think I go crazy sometimes just trying to figure it out what I am not communicating well to them…I mean, because it's so ingrained in my own mind."

Beyond a longer-term strategy of attempting to establish community norms, Mauro also adopted an in-the-moment tactic of stopping the lesson and waiting for students to stop talking, pausing the lesson until students acted in a way he thought appropriate (i.e., being quiet while someone else was speaking). In one particular class just before the winter break, I noted that Mauro used the silence strategy multiple times throughout the lesson. As he explained to the students, he opted for being silent to teach them to regulate their own behavior by recognizing when a certain classroom behavior—such as talking—was appropriate, and when it was not. Although some students understood Mauro's intent and cooperated with this strategy, even "shushing" those who were talking, others responded with indifference and continued to talk with neighbors.

Still others became contentious, expressing their distaste for "the silent treatment." One student called the tactic "immature," and several others voiced their preference for a more direct method: "Just tell us to be quiet!"

Occasionally, Mauro would also stop the lesson to discuss an unwanted behavior or remind students of appropriate social norms. This second strategy represented both a personal belief for Mauro and a social negotiation with the class. Personally, Mauro believed stopping the class to discuss behavior to be a rational, logical approach allowing him to explain his expectations clearly, help students develop self-awareness and self-regulatory skills, and maintain order, without resorting to what he considered to be authoritarian methods. The students, however, did not look kindly on this alternative method of classroom management. Instead, many perceived Mauro's discussion strategy as condescending. After one such class that was "shut down," Mauro related, "A few students "were telling me, like, they think I put them down! And I was like, no! And I was…reinforming them that, my investment is to all of you, like 100%." Other students thought it was unfair that Mauro stopped the lesson to discuss behavioral issues with the class instead of removing or ignoring uncooperative students. Mauro reported that he had several students advise him after classes to "kick [students] out, or have them go in the back, or just keep teaching and don't mind them, let them do whatever they want to do." This presented a dilemma for Mauro. On the one hand, he was disturbed that several students were upset over having their learning interrupted. On the other hand, however, he was committed to teaching all his students. Reflecting on this dilemma, he commented, "I'm not fully able to communicate with them why it is important that

everybody …(be)… taught and not just some people…I'm like, what's the point of school, then, if I'm only teaching *some* people?"

Mauro also attempted to build relationships with the ninth grade students using the same strategies he employed with his eleventh and twelfth graders. His efforts at "side conversations" and transparency, however, produced very different reactions from the freshmen. The tangential in-class chats, which had been so important in building relationships with his eleventh and twelfth graders, largely failed with his ninth graders because he was unable to refocus them after veering from the topic. Seeing that the side conversations took the class too far from the lesson objective, Mauro became reluctant to pursue student-generated tangential discussions, which in turn negatively affected his relationships with the freshmen. As he explained,

> If I even choose to sort of, engage them in whatever social conversation they are having about life, it can get carried away, and then I can't redirect them. So it comes to that, where, definitely my relationships with the freshman are not as strong as the upper classmen….[my upper classmen and I] take the opportunities to get to know each other and then we go back to doing work…the freshmen, it just can't be afforded to them.

His attempts to be transparent, though received positively in his earth science classes, were also met with disappointing results in his environmental science classes. In discussing his ninth graders' reaction to his transparency attempts, Mauro reported, "The freshmen have just been so difficult, to give them an honest conversation, I, I don't think they fully get (pause) why I choose to be honest with them, or why adults should be

honest with them, or (pause) I don't fully know." His endeavors to discuss the reasoning behind classroom assignments or behavioral expectations were met with disbelief by students, who believed, according to Mauro, he "was not one who is willing to listen, or to identify their needs with them."

Not giving up on a strategy that he believed promoted honesty and candor with students, Mauro tried asking his freshmen for feedback on his teaching. He remarked, "I don't think a lot of the teachers are willing to hear the needs and demands of the students, and I think that's where I really want to stamp my mark." Although at first the students were hesitant to speak to him about instructional matters in class, they soon began to voice their discomfort with inquiry-based lessons. Discussing the feedback students had given him, Mauro noted, "They've started to push back, and I've been willing to let them push back, you know, imposing less inquiry with the freshmen, and I think their response is better." One student in particular, he reported, "flat out told me I was going too fast."

To meet the needs expressed by his students, Mauro opted for simplifying his lessons. As an illustration, rather than assigning autonomous activities requiring students to puzzle through ideas independently or with peers, Mauro infused open-ended questions into his whole-class activities. To connect the ideas of evolutionary adaptation and natural selection, Mauro projected a PowerPoint slide depicting green and red beetles. Although the green beetles blended in with their surroundings, the easily visible red beetles were being eaten by birds. Mauro posed two questions to the class as a whole: "What is happening here? What do you think the beetle population will look like in 100 years, and why?" After eliciting two or three student observations, Mauro asked the class

at large, "What is evolution, and what is evolution to you?" A student offered, "It's how the world changes." Mauro nodded, prompting, "So it's about changing…" Another student ventured, "It's also about how *we* change." Mauro continued, "Perfect, people are talking about the theme of change. But let's focus on the WHY." After drawing out a few more comments from students, Mauro gestured to the slide. "OK, so how does this relate to the beetles?" A student replied, "The birds are going to start eating the green ones, and the red ones will be left over, so later the beetles will all be red." Mauro probed, "Yes, but what I want to know is WHY does that change happen over time?" As this example shows, adopting this strategy allowed him to provide follow-up questions and in-the-moment scaffolds for his students, as needed.

Even though he thought the students responded better to his lessons after making such changes, Mauro worried about the overall rigor of his teaching. He reflected,

> I think what's getting better is that I am simplifying a lot of things, and I think that's my biggest fear…that I don't know how much of the rigor I am compromising…like today was the first lesson I've ever truly paced appropriately [with the ninth graders] but that's also because I cut out a lot of things I would have probably initially intended…I fear, how much I am…lowering my expectations because I'm not fully aware yet of how to scaffold them to a point where I need them to be?

Repeatedly soliciting student feedback and using it to inform his planning was a democratic method Mauro had learned in his preservice program as a way to help cultivate student voice and produce more responsive lessons. What students asked for—

and what Mauro provided—was that he cut back on inquiry activities and use instead more teacher-directed instruction. In accommodating the students, however, Mauro contradicted his professed beliefs about learning. While Mauro tried to listen to his students' concerns and meet their needs, he feared that his own inexperience in scaffolding student learning had resulted in a watering down of the curriculum.

As the above analysis suggests, the unpredictable social dynamics evident in Mauro's environmental science classes put him in a constant struggle with his ninth grade students and made enacting the kind of open-ended, fluid practice that characterized Mauro's earth science classes very difficult. To minimize opportunities for conflict and mediate unpredictability, Mauro resorted to yet another strategy—filling the class to the brim with structured activity. He shared,

> With the freshmen, it really has to be, all eighty minutes are *booked*, and this is what we are doing at minute twenty, and this is what we are doing at minute thirty. Everything has to be scheduled because they—they still haven't developed that skill, that self-awareness, of 'when can I choose to do something' and 'when can I not do something.'

Although the resulting approach to teaching gave Mauro a sense of stability, the rigidity of structure meant fewer opportunities to break from his lesson plans to pursue unexpected or spontaneous questions, conversations, or connections.

Teacher identity development. Within his ninth grade classes, Mauro adopted a "persona" of the "strict teacher," becoming more authoritarian and controlling, which he felt helped him cope with the constant conflict and unpredictability that often

characterized his environmental science setting. Since he did not identify himself as a "strict" teacher, this adopted persona left Mauro uncomfortable and confused. Mauro remarked, "there are some characteristics that are very 'un-me' with the first years, where there is this unnatural strictness that sometimes appears." Because his ninth graders, in contrast to his upperclassmen, did not seem to respond to what he viewed as his "natural" demeanor, Mauro created a "façade" he hoped would be more "effective." Explaining this difference, he commented, "With those classes, because things are already dysfunctional…I feel like I have to be more serious and reactive with them." Mauro found this "performance" physically exhausting but was at a loss for other alternatives:

> I can tell [my ninth grade teaching] is a performance, because just how exhausted I am after those lessons, compared to lessons where I am…genuinely myself. Whereas in the lessons where I have to put on this… bizarre façade to be effective...I'm still trying to figure out how I can put myself in those lessons…while still being effective.

Becoming a teacher who resorted to authoritarian methods to assert control over students, instead of involving them in creating a democratic classroom community, caused internal conflict for Mauro and produced strong affective responses from him. In reflection on one particular ninth grade class, he reported,

> I had like, a brief spat where I just silenced the classroom. After school, [a student] was like, 'are you sad?' And then later, another student is like, 'are you mad?' and I'm just like, I have so many stages of grief right now, like I don't even know if my body could contain them all.

Mauro was uncomfortable with these emotional reactions. He was unsure whether he was "allowed" to express feelings in connection with his teaching, which created even more disequilibrium for him. Discussing this tension in the context of another turbulent ninth grade lesson, Mauro reflected: "I think, for the first time, I actually felt (pause) disappointed anger…the frustration was so built up that it just morphed into anger…the one thing is…are we allowed to do that? That's what we are struggling with."

Although Mauro desired to construct an identity for himself as a caring teacher in his ninth grade classes, his students did not perceive his actions as such. Mauro tended to maintain a calm demeanor and attempted to provide the class logical explanations for his actions, even in times of extreme conflict, moves that Mauro felt were indicative of his respect for his pupils. During one of Mauro's fourth period classes (the last class of the day) students were particularly resistant to engaging in planned lesson activities, making each activity much longer than anticipated as Mauro was forced to spend time trying to secure students' cooperation. The chaos came to a climax as an obscenity-filled argument broke out between several students. Mauro waited until the students stopped shouting, and calmly explained,

> Just to let you know where my head is at. The quiz is [next week]. Here's the thing, I'm not moving the quiz. … So for the next class, I was going to do a review, but now as a consequence…that's not going to happen because I'm going to have to teach the rest of the lesson that we are not going to get through today. Next class I'm going to have to teach the second half of this lesson as well as a review of graphing. Given the nature of our behavior today, it is dubious…that we

> will be able to have the review… Of course if you want to meet me after class I will always oblige you and help you out because you are taking your own time.

In Mauro's view, this type of honest explanation was a more humanizing alternative to punitive options (such as speaking to them angrily or in a raised voice) and was also connected to real consequences (not having enough time for a review) rather than punishments for their own sake. Unfortunately, as previously discussed, Mauro's ninth grade students considered such reactions as condescending and *de*humanizing, the opposite of what the teacher intended. As a result, they failed to respond in ways Mauro had hoped for. Thus, the students continued to disregard Mauro's requests for cooperation and ignored his attempts to communicate in what he felt was a rational and calm manner. In response, Mauro activated his "strict teacher" persona, confiscating students' cell phones if they were visible and keeping the class after school for nearly half an hour to finish the lesson. This in turn created further conflict in the class, as some students loudly protested the consequences, and others told the protesting students to "be quiet" so they could all finish the lesson and go home.

Context Matters

Beyond the influence of students, the data also point to other elements in Mauro's first year setting that helped shape his practices in the two subjects he taught. Specifically, my analysis of the observation and interview data revealed three contextual conditions that either enabled or constrained Mauro's teaching in substantial ways—whether the subject taught was tested, Mauro's level of familiarity and comfort in teaching the subject and its curriculum, and the size of his classes. When considered

alongside the influence of his students (discussed above), these conditions help explain the variance noted between the practices Mauro enacted in his environmental and earth science classes.

Testing

In Mauro's district, earth science was an untested subject. Freedom from testing, Mauro reported, gave him considerable flexibility in planning lesson and sequencing instructional content. Moreover, he felt the malleability of the curriculum gave him room to tailor his teaching to meet the needs of the specific students in his classes. Speaking to this advantage, he noted, "That's the great thing of being in this content area, there's a lot of discretion from teacher to teacher, and it's great for students to have that discretion for their benefit." The flexibility he was afforded in teaching earth science was also evident in the comfort with which he modified his instructional plans to address the circumstances that surfaced in the different lessons. For example, when Mauro realized that students needed a review of proportions before they could calculate the rates of seafloor spreading, he decided to spend an additional class reviewing the relevant concepts. When I asked Mauro if this departure from the plan would interfere with his unit schedule, he responded, "I'm fortunate enough where, I… [have] flexibility…[for] creating the curriculum…so I can afford to say yes, let's spend more time on [this concept]." whereas in environmental I don't get as many luxuries…[because] you are tested."

Because environmental science was one of the tested science disciplines within the district, Mauro was responsible for teaching the students a particular set of skills and

understandings that would appear on district-wide assessments (and to which his own teaching evaluation would be tied). To prepare their students to take the subject exam at the end of each semester, environmental science teachers were also required to follow a particular curricular sequence. While the district provided a pacing guide, Mauro found it relatively useless because it did not account for the various holidays and school scheduling constraints. Mauro also felt pressed for time in covering the material on which students would be tested, as the guide did not match the reality of the school calendar. He explained,

> …[District officials] don't consider a lot of the scheduling and testing, and they don't even factor in finals half the time…they even include June, and we don't even teach in June, because the finals happen a week before school ends…and you lose weeks in November [for multiple holidays]…they don't account for that. They just see the school year as being 186 days…and they said, OK, that's 92 classes, this is how this goes…so in environmental [science] we are rushing a lot more.

Mauro's worry about following the district's curricular schedule for environmental science affected his ability to achieve the kind of fluidity that often characterized his earth science classes. Because of the mismatch between the amount of content tested by the district and the actual instructional time Mauro had for teaching the material, he felt pressured not to deviate from the schedule and was less open to pursuing student questions and interests in class (although, as noted in the previous section, he reported that his ninth grade students' behavior also factored into the rigidity of his

environmental science lessons). Beyond making Mauro's lessons highly structured, the amount of content he was expected to cover also created additional stress that affected his in-class decision-making. This tension, in turn, influenced his interactions with students, particularly when unanticipated events threatened to take Mauro off-schedule. For instance, during a lesson addressing biodiversity (discussed in more detail in the previous section), multiple arguments broke out between students over the course of the eighty-minute period. Each time, Mauro had to intervene in some capacity, twice stopping the lesson after diffusing the confrontation and taking several minutes to remind the class of his behavioral expectations. Also throughout this particular lesson, several students violated the "no cell phone" policy, and Mauro began confiscating phones. Cumulatively, addressing each argument, discussing behavioral expectations with the class, and stopping the lesson to retrieve student cell phones cost Mauro nearly half the instructional time allotted for the period. Thus Mauro faced the possibility of ending the lesson short of addressing several key concepts students needed to learn for an upcoming assessment. Mauro responded by refusing to let students leave the class until they had finished most of the material he had planned, keeping the students approximately half an hour after the final bell had rung. Not surprisingly, his decision drew protests and frustrated comments from students. For instance, as Mauro finished reviewing a PowerPoint slide of definitions, a student called out, "Is this the last thing?" Mauro replied, "There's one more." The student threw her hands into the air, exclaiming, "Well, can't you just put it up? GOD!"

Familiarity with Curriculum and Experience Teaching the Subject

A second contextual factor seeming to influence Mauro's practice was the extent of his familiarity with the curriculum and prior experience teaching the subject during his residency year. Although Mauro had majored in environmental science in college, he reported feeling less prepared to teach the environmental science content. While his mentor had taught environmental science during his residency the year before, Mauro's role was with the eleventh/twelfth grade earth science class. Thus he had relatively few opportunities to work with the environmental science curriculum. Although collaborating with veteran environmental science teachers during scheduled common planning time might have provided support for Mauro, his responsibilities for leading the earth science common planning meetings meant he had a different preparatory period than other environmental teachers. Describing how this limitation affected his planning, Mauro commented, "I have to focus so much on Earth [science] that I depend on other people to invest in the environmental, and I'm not there for common planning—Earth is my prep."

Mauro felt more confident in his teaching of earth science than environmental, deeming his earth science lessons to be "more successful." He attributed this accomplishment to his experiences leading the earth science curriculum mapping and co-teaching the subject during his apprenticeship year. Describing the more favorable conditions for enacting his preservice learning in the earth science classes, he noted, "I think again, I'm more successful with the upperclassmen both because I know the content more, and because I taught the content last year, and a lot of things favor them right now, I think." His comfort with the content and previous experience teaching may have

contributed to the ease with which he was able to modify or provide scaffolds in mid-lesson in response to students' needs. Mauro's use of a student question as a transition into an activity regarding continental drift illustrates this strength. As he passed out directions, a student peered at the text and asked, "What does it mean, 'Does the continental shelf match up to the continent?'" Mauro turned to the class and announced, "So [student] just gave me a great segue-way question. What does this mean, 'It matches up with the continental shelf?'" When no one answered, Mauro added, "What is a shelf?" A student ventured, "Like in your house? Something you put stuff on?" Mauro continued to elicit answers about the characteristics and function of a shelf, his facility with this concept allowing him to relate it to items familiar to the students, thereby creating a bridge for them to the current content.

Class Size

Two out of Mauro's three earth science classes had fewer than twenty students, which he considered another factor making teaching this subject easier for him. As Mauro explained: "My smaller classes just have better grades… functionally class size does have a determining effect on how students are able to learn things... smaller numbers are just easier to work with." In his smaller classes, Mauro was able to spend time working either one-on-one or in small groups with students, easily able to rotate between the five or six pairs or trios of students to check for comprehension and ask probing questions. The small size of his classes also allowed him to quickly see if students were following instructions. In one instance, Mauro had projected a slide of vocabulary words for students to write in their notebooks. He swiftly made rounds,

asking students, “Are you getting this down?” A student at one of the tables grouched, “Why are you bothering us?” Mauro replied, “I’m visiting everyone! That’s what I love about small classes!” He laughed and gave the class a thumbs-up sign.

Mauro’s two ninth grade classes were his largest, with approximately thirty students each (due to student mobility, the numbers fluctuated somewhat throughout the duration of this study). The large number of students often complicated social negotiations and contributed to the loss of instructional time, as Mauro struggled to keep learners focused on the task at hand rather than talking to one another about other topics. For example, as Mauro attempted to transition students to an activity exploring the environmental adaptations a chameleon had developed for its environment, many students chatted at their tables and disregarded his call for attention. Mauro announced to the class, “I’m waiting,” indicating that he was planning to wait to begin until he had the attention of the entire class. Although the majority of students quieted and redirected their attention to the slide Mauro was projecting, students sitting at two tables continued to talk. Mauro announced again, “I’m still waiting…” When a handful of students still disregarded his remark, Mauro walked to one table, quietly saying, “I need your focus up here now.” This quieted the two students talking at this particular table. With his attention away from the class as a whole, however, other students disengaged from the task at hand and began to talk to their neighbors. When Mauro finally had the attention of the class, nearly eight minutes had passed.

Discussion

Because the central role of teachers is arguably to engage the students they teach in school learning, those learners are the most critical element in the setting. Mauro's case illustrates that without students' willingness to participate in learning activities teachers create for them, the teaching-learning process is likely to fall short of the desired goal. As this suggests, students hold considerable power in the classroom. To succeed in first-year teaching, novices must learn to negotiate their teaching practices with their students. In Mauro's case, differences between the upper classmen and freshmen contributed to the substantial dissimilarities in the practices observed in his earth and environmental science classes. As shown, Mauro was considerably more successful in negotiating the practices from his NUTR program with upper classmen than with his freshmen.

Mauro's case points to the complexity of transitioning to teaching and applying preservice learning in the first year of practice. Upon entering the profession, new teachers must engage in an intense phase of learning to teach, one that is perhaps even more demanding than that experienced during their preservice preparation. The core of the challenge is that the conflux of elements present in the setting—of which the teacher is a part—can come together to shape practice in unpredictable ways. Drawing on ideas from the theoretical framework of rhizomatics and equitable teaching presented in Chapter 2, I close Mauro's case with a brief discussion of the differences in teaching practices noted between the two classes; the complexity of enacting teaching practice;

and the particular challenge of enacting socially just, learner-centered teaching practices in urban schools.

Differences in Teaching Practices

Despite having a solid preparation in inquiry-based instruction from his preservice program, completing a year-long apprenticeship in the same school where he taught his first year as a teacher, and receiving the support of the principal and several colleagues who subscribed to inquiry-based instruction, Mauro's teaching of earth and environmental science classes diverged significantly. As discussed above, differences in the confluence of factors at play between the two instructional settings affected his ability to engage students in planned instruction, thereby influencing the enactment of his preservice learning as well as shaping his burgeoning teacher-self. The rhizomatic concept of *assemblage* (Deleuze & Guattari, 1987) may help explain the differences in the teaching practices observed in the two sets of classes.

As explained in Chapter 2, assemblages are multiplicities, an array of elements that work together for a particular purpose (Livesey, 2005). Extending this concept to Mauro's case, the confluence of elements detailed above can be considered a *teaching-assemblage* that operates to construct a teacher's practice. Those elements included aspects of the **teacher's background** (e.g., Mauro's preparation in inquiry-based teaching, personal inclination to using thoughtful questions in teaching, commitment to helping marginalized students access instruction, completion of a residency year in the same school in which he taught, familiarity with the earth and environmental science curricula); aspects of the **students' backgrounds** (e.g., level of maturity, skills,

orientation toward schooling, understanding and comfort with the expectations placed on learners in high school); aspects of **the classroom settings** (e.g., class size, physical location and space), and aspects of **the school and broader policy context** (e.g., subjects tested district-wide, prescribed schedule for teaching tested subjects, Mauro's responsibility for coordinating the earth science curriculum, scheduling conflict preventing him from meeting with his environmental science colleagues for coordinating the planning and pacing of instruction). Viewing Mauro's teaching as assemblage—an amalgam of teacher-students-classroom-school and broader policy context elements—offers a way to discuss the practices of a first-year teacher, or any other type of teacher for that matter, as constructed by a multitude of influences.

I contend that considering Mauro's two sets of classes as their own teaching-assemblages allows for a more complex discussion of teaching, one that avoids depicting instruction as a set of actions that are either fully controlled by the teacher or fully determined by factors beyond the teacher's control. This perspective generates a more nuanced understanding of the production of Mauro's divergent practices, negotiations, and constructions of teacher-self. Although each assemblage had some elements in common—such as Mauro himself, the school setting, and a common student demographic—these "plugged into" or came into composition with each assemblage differently. In the earth science classes, freedom from testing, familiarity with the content, and relatively small classes worked well with the maturity of the upperclassmen to provide conditions that enabled Mauro to enact his preservice learning. Within these conditions, Mauro was able to build relationships with his upperclassmen that facilitated

their negotiation of student-centered instructional practices he brought to teaching from his preservice program. The productive interactions between Mauro and his students, as well as Mauro's feelings of success in his teaching, fed into his construction of a positive teacher identity in relation to his earth science classes.

In contrast, the tested nature of environmental science, Mauro's lack of familiarity with the curriculum, and larger class sizes, combined with the ninth grade students' tendencies, created a classroom environment often characterized by student opposition and tense teacher-student interactions. Lacking the same level of student cooperation afforded by his upperclassmen, Mauro made his teaching more rigid and teacher-led. Alongside the challenges Mauro experienced in his environmental science classes, he also began to develop a teacher identity distinct from that of his earth science classes, a "strict teacher" persona he felt forced to adopt to be "effective."

The Complexity of Enacting Teaching Practice

The differences in the construction of practices between Mauro's two sets of classes also point to the general complexity of "transferring" preservice learning to the classroom setting. Mauro's sets of classes and the ways in which they worked provides insight into the complex, non-linear process of enacting practices learned in teacher preparation programs. To develop a better understanding of this process requires movement beyond the consideration of preservice learning as an "object." Students of teaching do not assimilate pedagogical theory, knowledge, and skills, as discrete *things*, and "transfer" them into classroom settings whole (Korthagen & Kessels, 1999, p. 5). Rather, enacting teaching strategies learned in preservice preparation to first-year

teaching is an intricate undertaking. First, preservice teachers interact with pedagogical ideas and make meaning of them through a filter of their own beliefs, values, positionalities, histories, and experiences, among other factors (Borko & Putnam, 1997). The data presented in this chapter show that upon entering the classroom, the teacher must continue to make meaning as she engages in ongoing negotiations with students, all within a particular context that also influences the practices enacted. That is, first-year teachers must hammer out their practices through ongoing interactions with students, while simultaneously being shaped by contextual factors in the school setting.

A product of multiple and continuous negotiations with students and contextual factors, Mauro's practices cannot be characterized as a pure and direct application of the type of learner-centered strategies he learned in the NUTR program. While his first-year teaching included some elements of learner-centered teaching, typically in modified form, it also included evidence of teacher-centered instruction. Returning to the rhizomatic concept of assemblage, we might consider preservice learning as one of several elements the teacher brings to teaching, which becomes fused with many other contextual elements of a teaching-assemblage. As Mauro began his first year of teaching, he "plugged" himself—including his beliefs, personal history, and his developing understanding of inquiry-based teaching and other learner-centered practices—into his teaching, constructing his practices differently according to the confluence of interacting elements present.

Enacting Socially Just, Student-Centered Practice in Urban Schools

Although learner-centered practices grounded in student knowledge are taking root in suburban settings (Cohen, 1988; Achinstein, Ogawa, & Speiglman, 2005), and are often promoted as "good practice" by teacher education programs (Black & Ammon, 1992; Villegas & Lucas, 2002), this type of teaching is not the norm in urban schools (Kozol, 1991/2005; Thomas, 2013; Haberman, 1995/2010). Such practices are even more rare in low-track classrooms, which are typically characterized by low-level, skill-based learning (Anyon, 1981; Oakes, 1985/2005). Beyond these patterns, research on first-year teaching also demonstrates that new teachers—who are likely to be placed in urban schools—tend to adopt entrenched instructional practices even when taught differently in their preservice programs (Allan, 2009; Chubbock, et. al., 2001; Massengill, Mahlios, & Berry, 2005; Veenman, 1984). This suggests that the aspects of Mauro's teaching that echoed his preservice learning could be considered breaks from customary urban school practices, including patterns of first-year teaching, with the potential for disrupting mechanisms and discourses of schooling that reproduce inequalities. From a rhizomatics perspective, these deviations from the status quo are considered *lines of flight* (Deleuze & Guattari, 1987). Such escapes from the norm, or lines of flight, happen unpredictably and are always recaptured: the bell rings or the teacher must cut off a generative student conversation to return to the objective. Constructed over time, however, lines of flight potentially result in larger changes to normative conditions, such as the low-level, teacher-centered instruction typically found in urban schools.

Mauro's mediation of the challenge of enacting learner-centered practices with marginalized students provides an example of the changes potentially afforded by continually seeking lines of flight over time. Unlike teacher-led instruction, where students play a passive role during lessons, learner-centered practices require students to play an active part in their own learning. Students from groups that have been historically marginalized in schools tend to have few people in their lives, if any at all, for whom schools have served as an avenue for upward social mobility (Kohl, 1995). Lacking faith in schools, they are likely to resist teachers' attempts to engage them actively in learning (Ogbu, 1986; Ogbu & Simmons, 2008). Remarkably, in his earth science class Mauro was able to build relationships of trust with his students over time (a reconstructed line of flight), thereby securing their participation in learner-centered activities that might have produced resistance otherwise. However, the confluence of elements and contextual conditions in Mauro's environmental science class were such that Mauro mainly reinforced the status quo of teacher-led lessons and an authoritarian teacher persona, which drew out oppositional student behavior. As such, trusting relationships proved more difficult to develop with the ninth grade students, a factor that contributed to the difficulty of enacting his preservice learning in his environmental science classes.

Chapter Five: Bruce

The second case in this study is that of Bruce, a ninth grade physics teacher. Like Mauro, Bruce constructed his early teaching practice by modifying elements of what he had learned from his preservice preparation in the NUTR to fit his new school and classroom contexts. In contrast to Mauro's experience, however, Bruce's first year teaching was more strongly constrained by conditions existing in the school where he taught, by his own internal tensions about teaching, and by interactions between these elements.

This chapter details how Bruce's personal views of teaching, the actors in his classroom and school setting, and contextual features themselves combined to shape his early teaching practice. In developing the case, I first provide an overview of Bruce's background and the school where he taught during his first year as a teacher. I then examine Bruce's emerging practice, focusing on 1) how he adapted features of his preservice preparation to his new students and setting; 2) how he negotiated with the students to secure their participation in day-to-day classroom activities; and 3) how his sense of self as a teacher developed in relation to those ongoing negotiations, his own inner tensions about the work of a teacher, and other factors in the school setting that exerted pressure on his early teaching. In the concluding section, I discuss the contextual conditions that shaped Bruce's emergent practices and offer interpretations for the inconsistencies and tensions that characterized his teaching.

Case Background

Bruce's Background

A twenty-five-year old native of a small suburb in the Northeast, Bruce was a tall, stocky Jewish male who was never without the small, often brightly colored disc of his Yarmulke on his head. Although Bruce had grown up in a conservative Jewish household, he adopted Orthodox views later in life and married the daughter of a Rabbi in his early twenties. A combination of scientist, thespian, and religious devotee, Bruce graduated from one of the most well-known and prestigious Jewish universities in the country with a B.S. in physics, a B.A. in Theatre Arts, and an Associates degree in Jewish Studies. Further reflecting the multi-faceted nature of Bruce's interests and talents was his love of computers and technology. In college, Bruce worked for the "Geek Squad," a technology support service facilitated by a large electronics retailer. He was a fan of online gaming, loved to attend local renaissance fairs—in costume—and was a zombie movie enthusiast (which prompted his choice of pseudonym, after Bruce Campbell of the cult classics *Evil Dead* and *Army of Darkness*).

Much to the chagrin of his parents—whom he described as "Old-world Jewish immigrants straight from Transylvania"—Bruce began thinking about a career in education at a young age. Because he excelled in mathematics and science, Bruce considered satisfying his mother's aspirations for him by pursuing a Ph.D. and becoming a professor of science. Only one semester into his graduate studies in engineering, however, he found himself overcome with boredom and decided to rethink his career path. After leaving his graduate program, Bruce found an advertisement for the Northeastern

Teacher Residency. He reported that the program appealed to him because of its social justice focus. He had attended primary school in a relatively low-income area and high school in an area noted for its affluence, and was struck by the difference in educational quality. He reasoned that if he pursued a career as a high school teacher, he would work in a place where quality teachers were needed the most, and considered the district in which the NUTR was located a good match. After a grueling interview process, Bruce was accepted as the lone physics candidate in the second cohort of the secondary NUTR program.

Alongside his peers, Bruce studied socio-cultural learning theory (Vygotsky, 1978), inquiry-based learning (Freire, 1970; Windshitl, 2000), and democratic teaching methods (Dewey, 1916). Although all the residents initially struggled with the transition from a transmission-based model of teaching to one emphasizing learner-centered, inquiry-based instruction (Klein, et. al., 2013), Bruce found this paradigm shift particularly challenging. In my first interview with him, Bruce noted that upon beginning the NUTR program he imagined his future teacher-self as a distinguished physics professor who taught through lecture. He reflected,

> Initially at the beginning of the year, I thought it was all about lecturing to explain. It's all about explanations…explanations and demos…that are teacher led. Because that's how I learned it. And the teacher has the knowledge that you have to absorb…instead of allowing them to discover things, and debate things.

Bruce's propensity to spend large chunks of instructional time lecturing, along with difficulty managing his time both for planning lessons and facilitating in-class activities,

contributed to a bumpy journey during the residency year. In the second semester of his preservice year, Bruce received intensive intervention from NUTR faculty members, with explicit attention to planning instruction in ways that would both support student learning and enable him to assess the extent to which his learning objectives were met. To help him improve his skills for relating to students, program faculty asked Bruce to shadow a student for a week. At one point his ability to complete the program was in question, but by the end of the second semester the instructors and his mentor were satisfied with his progress and considered him ready to graduate. Nevertheless, faculty instructors communicated to the NUTR induction program director that Bruce would need the most intensive supports of all the graduating residents, especially regarding organization and developing interpersonal relationships with students.

Bruce described his teaching style as "teacher-directed, with breakout demonstrations." Explaining that he believed hands-on learning was necessary for students to engage with physics concepts and see them in action, he noted, "I want them to visually see something, to connect something to reality." He also described his ideal lesson as one involving high levels of student autonomy and discussion, with "a lot of student to student discourse…[and] the students taking it so far that it actually goes out of my hands and they actually take over the lesson." Despite professing these active, student-centered views, Bruce also feared the professional repercussions of not conforming to the more traditional teacher-centered instructional format. In the beginning of the year, Bruce confessed that he "didn't want to shake the boat" with lessons that were "too out there" from what he thought other physics teachers were doing. These

early worries foreshadowed the tensions that would contribute to his negotiation of teaching practice during his first few months of teaching.

School and Classroom Setting

Northeastern Preparatory Magnet School (NPMS), where Bruce was hired as a first-year teacher, focuses on preparing students for college. The school is located in a section of the city known for crime and poverty, situated among run-down housing projects and boarded-up, abandoned buildings covered in graffiti. Currently, NPMS serves students in grades six through nine. Three years prior, NPMS had opened with one sixth-grade class and since then has added an additional grade each year. The school plans to continue expanding by one grade level for each consecutive year until eventually supporting grades six through twelve. NPMS had developed a partnership with a local community college, and once students reached eleventh grade, they would begin taking some of their classes with the community college and receive college credit. During the months that I observed Bruce's teaching, NPMS was "co-located" with two other schools (both charters), meaning that all three schools shared one building.

Classroom setting. Because of the co-location, the NPMS experienced space problems, making it necessary for some of the teachers to share classrooms. Bruce shared a small classroom with a veteran French teacher. According to Bruce, his roommate immediately took the single desk and claimed most of the decorating space. Thus, pictures of France and posters of French conjugations dominated the walls. As a result, little to nothing in the room indicated that physics was also taught there. Because the school would be housed in the current building only temporarily, the district had not

updated classrooms for modern technology or science learning—just old-fashioned blackboards on two of the walls and single desks with attached chairs. Beyond the unsuitability of the classroom for experimental or laboratory activities, Bruce had no textbooks or science equipment. To provide appropriate physics lessons for his students, Bruce brought in personal materials, such as his own collection of Nerf guns and ball launchers (plastic toy weaponry that shoot soft Styrofoam-like projectiles).

Students. Although the relative newness of the school meant that data were not available via the state report card or the school website, the website of a well-known national foundation that provided additional funding for NPMS described the student population as follows: "All students in the school are students of color and students whose prior academic achievement was below grade level." All but two of the students in Bruce's classes were African American. Each grade level in the school served between 60-70 students, bringing the overall enrollment to approximately 250 students. Because NPMS was not a neighborhood-zoned school, most of the students were bussed in from other areas of the city. According to Bruce, many of his students had begun attending the school as part of the original sixth grade class.

Only one academic track within the school existed, which meant every student took physics. Bruce's students had a wide range of mathematic skills, and he reported feeling challenged to teach the highly rigorous physics content while simultaneously supporting many of his students in building the mathematic foundations needed for physics applications. Because of this difficulty, he commented, "I get a lot of resistance in [math-focused lessons]." Although the data I collected corroborate Bruce's statement

that some of the students tended to “shut down” during purely math-focused lessons taught in a lecture-based manner, more interactive classroom activities were received with enthusiasm.

Leadership. The founding director of the school had hired Bruce the previous June to teach ninth grade physics. An educator and school leader of more than thirty years, the director sought to create a family-like atmosphere within the school, and the students affectionately called her “Grandma.” The open learning environment the director cultivated gave students considerable freedom within the school and encouraged active learning experiences, which may have explained the natural enthusiasm toward learning that Bruce’s students tended to display in lessons I observed (a circumstance discussed in more detail later in the case). In his first interview, Bruce remarked that the founding director had expressed affinity with elements of his preservice preparation—such as creating a democratic learning environment, promoting students’ voice, and teaching through inquiry—and had even met with him two weeks into the school year to request that he make his lessons more learner-centered. However, the original school director suddenly retired in November, and a new leader, who preferred the title “principal” to “director,” took over the position.

The principal was also Bruce’s direct supervisor. Given its small size, the school had no department chairs or supervisors, leaving Bruce to answer directly to the principal. Bruce felt this organizational arrangement would deprive him of ongoing professional support since the principal could not be as involved with his classroom instruction as a department chair might given her new administrative duties. His concerns proved to be

well founded. The new principal did not formally evaluate Bruce's teaching until December, and despite his repeated requests for feedback, she never formally debriefed with him about the lesson observed.

The original school director assigned Bruce a school-based mentor who was a veteran seventh grade life science and eighth grade earth science teacher. According to district policy, Bruce's mentor was to observe him teaching a minimum of one full lesson per week for the first five months of the school year and provide coaching based on the weekly observation. During the first month of school, Bruce was enthusiastic about their relationship, commenting that his mentor had given him "a lot of positive feedback." By October, however, Bruce reported that his school-based mentor's visits had dwindled, and when he did observe Bruce teach, his observations lasted mere minutes at a time. He also characterized his school-based mentor's teaching style as "traditional," which Bruce thought to be incompatible with his own (although, as will be discussed in the next section, Bruce's own teaching was mainly characterized by teacher-led instruction). To further complicate matters, Bruce's mentor had never taught physics, and was unable to provide content-related support.

Part of the NUTR's continuing support of Bruce included an induction coach, whose role was to observe Bruce's teaching regularly and provide him with feedback. A secondary responsibility of the NUTR induction coach was to collaborate with his school-based mentor to ensure that Bruce received on-going, tailored instructional support. However, the NUTR program had difficulty finding an appropriate induction coach for Bruce, and he spent the first several months without induction support from the

NUTR program. Near the end of November, Bruce reported that he had finally been assigned a retired elementary teacher who had worked in the district's now-defunct science center (but had never taught secondary science in a classroom setting).

Teaching schedule. Because of the small school size, Bruce only taught three forty-minute physics classes of 15-17 students each, in addition to a morning homeroom period and an afternoon study hall. Bruce explained that this schedule and the small number of students gave him "time to get to know my students, [to] find out their interests." Because he only taught three instructional periods, as opposed to the six that most other teachers in the school were assigned, he had three forty-minute free periods. However, Bruce felt this free time was offset by the task of teaching a mandated physics curriculum, the Progressive Science Initiative (PSI), which was intended to prepare students for Advanced Placement (AP) physics (Goodman, 2006). As such, the curriculum had a strong algebraic focus, which presented a problem, Bruce explained, because "there is stuff [the students] do here they haven't done in math yet…so their math skills aren't there yet." Bruce also saw the PSI curriculum largely incompatible with inquiry and experiential teaching, forcing him to spent additional planning time figuring out how to accommodate both in his teaching.

Content. I observed Bruce three times from late September to early October, prior to the change in school leadership at NPMS. These three lessons introduced the scientific method and the kinetics concepts of accuracy and precision, accompanied by the appropriate formulas. When I returned to observe Bruce's unit in mid-November, the new principal had just arrived. The main topic of the unit, which lasted through the first

week of December (fourteen classes), was dynamics, which folded the kinetics concepts learned in September and October into new physics concepts like free-body diagrams. I returned for a final mini-unit observation during the second week of January. These three final lessons addressed the concept of gravity through a cross-curricular project requiring students to design and build a three dimensional "sustainable space station" with an artificial source of gravity. During two of the lessons students worked in groups to build their model space station, followed by a third lesson in which students presented their work. For a more detailed list of lessons, see Appendix A.

Bruce's Teaching

My analysis shows that Bruce's enactment of practice was largely shaped by his traditional beliefs about teaching, which interacted with environmental conditions—such as the upheaval caused by the unexpected change in school leadership—to produce inconsistent teaching patterns. For example, one lesson might involve students exploring physics concepts, such as force and magnitude, by firing Nerf guns. The next lesson, however, might require them to spend the entire instructional period completing a worksheet of math problems connected to physics applications. Yet, despite his tendencies toward transmission-based instruction and pressures originating in the larger school context that reinforced these views, Bruce did not abandon his NUTR practices entirely. Instead, the tension resulting from these conditions produced contradictory teacher-selves that were reflected in Bruce's intermittent use of traditional and learner-centered, inquiry-based instruction.

Enacting Practices Learned During Preservice Preparation

Despite Bruce's inclination to be teacher-centered, he nevertheless worked to incorporate into his first-year teaching elements of the student-centered practices learned through the NUTR program, although in substantially modified forms. These elements included the use of experiential demonstrations, learner-centered projects, collaborative learning opportunities, and some democratic teaching.

Experiential demonstrations. Bruce characterized his practice as "direct instruction with breakout demonstrations," and was more confident with this type of teaching largely because he considered it "safe." While the original school director had espoused a similar pedagogical vision to that of the NUTR, the principal who took over in November was more traditionally oriented and preferred teacher-led instruction. As Bruce saw it, direct instruction with breakout demonstrations was more acceptable to the new principal than the inquiry approach advocated by NUTR. Bruce also believed that traditional teaching was more in keeping with the PSI curriculum he was expected to teach than was the student-centered learning approach he had learned through the NUTR. Perhaps most fundamentally, the direct instruction with breakout demonstrations style Bruce came to adopt was consistent with his personal view of teaching, which he envisioned as helping students link abstract concepts to real life experiences through demonstrations of physics phenomena. To describe his philosophy regarding this type of teaching, Bruce paraphrased an Albert Einstein quote: "One demonstration or one actual visualization is much better than a thousand formulas." Bruce also saw his demonstrations as a way for students to explore questions connected to the content,

explaining, “I want them to see the phenomenon, and to ask questions about the phenomenon.” For Bruce, this was a way he incorporated ideas about inquiry learning into his physics instruction:

> It’s not like a full-blown inquiry-based lesson, but if a student has a question…I’m like, “Let’s discuss this.” I leave it open for them, because I want them to ask those kinds of questions. It’s a lot stronger than any example I could give.

In several of the lessons I observed, Bruce interspersed direct instruction about physics concepts and mathematical applications with brief opportunities to visualize the topic at hand. For instance, when discussing Newton’s first law, Bruce played a short video introducing each law and then engaged students in a series of short demonstrations to provide concrete examples of the laws. After the video, Bruce walked to the board and asked students to recall the first law. When no one answered, he took up the chalk and wrote: “An object in motion will stay in motion. An object at rest will stay at rest. UNLESS force acts on it.” Bruce then turned and retrieved a bowling ball, placing it on a table in the middle of the classroom, where it balanced perfectly still. “What do you see happening here?” he queried the class at large. When students observed that the ball was not going anywhere, he took the bowling ball and rolled it across the room until it hit the wall, again asking them to make observations about what was occurring. “So that’s Newton’s First Law,” Bruce told the class. “The second law is just a formula.” He began to write the formula for the second law on the board. “Everyone getting this?” he asked. After briefly explaining the second law—force equals mass times acceleration—he

moved into a second demonstration. Bruce asked a student volunteer to join him, and he said, “We are going to exert a force on the wall. There’s no reason the board shouldn’t go through the wall, right?” He and the student began to push on the wall. “What’s happening? Why isn’t the wall moving?” Bruce called out dramatically. Students shouted back answers: “There is something blocking it!” “The wall is stronger than you!” “There are two forces,” Bruce replied. “One force is me, and one is the wall. So that’s the third law. For every action, there is an equal and opposite reaction. I push on the wall, the wall pushes back on me.” He walked back to the board and once again wrote a definition on the board for students to copy.

In a second illustration of Bruce’s tendency to intersperse direct instruction and demonstrations, he introduced the concept of tension by providing a teacher-led problem solving exercise followed by an experiential visualization. Bruce first posed a problem that included tension, a force variable—that is, a manner of representing a force—with which students were not familiar. After working through the problem, identifying the force with which a string was being pulled downward, and naming tension as the missing variable, Bruce said, “OK, here is what I want to show you about strings and tension.” He twisted a hand towel into a spiral and offered the end to a student. Once he had grasped the end of the towel, Bruce asked the student to pull the towel. “OK, now I’m going to pull on my end,” Bruce told the class. “You feel the pull, right?” He asked the student, who nodded. Bruce continued, “So, whatever force I’m pulling with, he’s feeling, even though we’re not touching. The force travels. So if I pull, he can feel it. If he pulls, I can feel it.” The student pulled his end of the towel, and Bruce jerked forward. Turning back

to the board, Bruce gestured at the problem and said, “So the same thing is going to happen here.”

These moments of experiential learning not only provided concrete representations of content for students, but also engaged them interactively with physics concepts and seemed to ignite enthusiasm for the subject. The following example shows Bruce’s students’ excitement and engagement in learning, evident in their eager participation in a demonstration Bruce designed to show the process of conducting experimental trials. I had arrived early for my observation, and Bruce’s desk was covered with at least ten different models of brightly colored chartreuse and vermilion Nerf guns. The room echoed with a cacophony of teenage chatter, and as Bruce entered the room, a student yelled out, “Shut up! It’s Nerf time!” Bruce crossed to his desk and selected two different models, holding the plastic guns up for students to see. “Today we are going to investigate a question even Newton couldn’t answer,” Bruce told the class. “Which one [of the guns] shoots faster?” The room filled with excited student voices offering opinions, and Bruce handed one gun to a student, inviting him to come up to the front of the classroom. “Now, how are we going to test this?” he said, referring to the question he had just posed. The students yelled out, “Shoot it!” “Shoot them!” The student fired, and Bruce waited a beat before firing. Several students shouted, “No, you have to do it at the same time!” “Ohhhhh,” said Bruce, picking up a piece of chalk and walking to the board. “So we need to shoot at the same time.” He drew a number one and wrote the students’ instructions. The demonstration continued until, after at least eight or nine trials, the students and Bruce were able to identify a list of procedures for ensuring

an accurate comparison of the speeds of the two guns. Bruce concluded, “So just to summarize, when you do an experiment, the first time it is always going to go wrong, and you are going to have to go back and modify it, then record your modifications and the new outcomes.”

This activity, while teacher led, engaged the entire class, helping students understand a fundamental scientific concept. The activity also demonstrates the typically unstructured nature of Bruce’s teaching—no introduction was provided, no instructions were given, and no opportunity was offered for students to make connections or synthesize the main idea, other than Bruce’s summary at the conclusion of the activity. Although in this particular example students were excited and engaged during the short time frame of the demonstration, the lack of structure and support typical of Bruce’s teaching sometimes led to disengagement in lengthier activities, as discussed next.

Learner-centered projects. As noted above, Bruce’s teaching was mainly characterized by direct instruction accompanied by teacher-led demonstrations. However, during the observations I conducted, Bruce also provided a handful of opportunities for students to explore and inquire about phenomena for more extended periods. These opportunities included extended demonstrations, a three-day lab activity, and a two-week interdisciplinary project. The three-day lab, for instance, was planned on the heels of several classes where students learned to create free body diagrams (pictures used to visually analyze the forces acting on a body or object). He explained that this lab connected the present topic with previous learning for the year, “a culmination of

kinematics, dynamics, and full-body diagrams," with an overall guiding purpose "to figure out with what force a Nerf gun fires." He expanded,

> This ["With what force does a Nerf gun fire?"] is THE big question over the next couple of days. I broke it down with what questions they should be asking themselves when trying to solve this. Day two is a lot more formalized. And then day three is even more formalized. I'm going from non-structured to structured.

On the first day of the lab, Bruce intended to have students create their own procedures to perform their experiment. Explaining the purpose of this exercise, he described, "I want them to do their own stuff. I want them to use methods that are comfortable to them, I want them to experiment with methods." Bruce provided a single guiding sheet with the purpose of the project at the top in italics, followed by the three-part directions. The first day of the lab was dedicated to students' creation of procedures for finding the force with which their Nerf gun fired a dart, and the second was intended for students to perform their experiment, record their data, and table it. On the final day, students would create a free body diagram for their Nerf dart, calculate the acceleration of the dart using the correct kinematics formula, and finally, solve for the force using their collected data from the previous day. Other than this single directions sheet, no additional resources or scaffolds, such as a graphic organizer, were given to support students in their completion of the three-day task.

When I asked Bruce about his structuring of the project, he explained that for a "100% hard inquiry" project, he felt he should leave the assignment as open-ended as possible. The project directions were relatively ambiguous during the first two days of

the project, and no organizational scaffolds were provided for students. Without these supports, many students struggled to make sense of the task. During the first day of the project, in the class that I observed, students disengaged from the task almost immediately. In order to gain their cooperation, Bruce had to lead the class through an on-the-spot review of the components needed to measure force. The lost time at the beginning of the lesson, combined with the improvised review, took nearly all forty minutes of the class period and meant that Bruce did not reach his objective the first day. On the second day, he revised his instructions, asking students to come up with "a plan of action" to conduct their experiment—a framing that students seemed to understand better than "create procedures." During the class period, he rotated between tables, asking to review the students' procedures before he relinquished a dart gun for their experiment. As groups began their trials, Bruce checked in with each group, many of which needed additional support and repeated or clarified instructions. During the remainder of the class, Bruce continued to spend time with individual groups, in some cases having to provide information to them that could have been anticipated in advance, such as the need to complete multiple trials and average them. Bruce did not assign specific roles for each student or otherwise provide structures to ensure the participation of each group member, and in some groups only one or two students were working while others socialized or played with their phones.

Because of the students' difficulties navigating the ambiguity of the project, the lab took two periods longer than originally planned. In Bruce's reflection after the lesson, he was unconcerned about providing structure and scaffolds for students to complete

projects demanding high levels of independent learning, preferring instead his tactic of checking in with each group individually during the project:

> I went group by group to see what they were doing. I wanted to see what they would do…I was seeing one group only take one measurement apiece, so I'm like, let's take another measurement. I misfired, so I could show them that hey, maybe one measurement is not best. I let them come to that conclusion after I fired twice. So that group was the least, um, on top of things. But I went around from group to group to make sure they were participating.

Collaborative learning opportunities. Bruce considered student collaboration (a major emphasis of the NUTR program) an important element of his teaching. Discussing the grounding of his assignments in social constructivism (Vygotsky, 1978), which emphasizes the social aspect of learning, Bruce explained,

> I'll pose a question that will utilize the ZPD [Zone of Proximal Development], where they can reach it with their groups but they wouldn't be able to reach it individually. Whether that be…do we weigh more on the equator than on the north pole? So realistic, applied questions, and then have them discuss it in their groups. But one that actually makes them utilize the ZPD.

During my observations, collaborative activities—such as shared problem solving—occurred, though on an inconsistent basis. Bruce did not always start his class with a "do-now" (a warm-up activity), but when he provided one, it was normally in the form of a problem with similar features to one they had solved the class before or in homework, but with some sort of foreshadowing feature of the current class topic. For instance, during

the dynamics unit, Bruce began his class by posing a problem involving a free-body diagram. This scenario built on the skills students had learned in his class the prior day, but added a new twist that he wanted students to puzzle through on their own. Bruce told the students, “This is tough, so I need you to work in pairs.” Other do-now problems were presented with the option to collaborate: “If you need to talk to your neighbor, you can.”

Bruce also relied on student collaboration as a method to mediate missed work from frequent student absences. For instance, after a lesson that two students had missed, he asked those two students to join him at a side table while other students in the class were taking a quiz. He handed them each a sheet with several scenarios using formulas for force, mass, and weight. After explaining the difference between weight and mass, Bruce told them, “OK, now try numbers 21 and 22. Work together. I want to hear you talking back and forth, OK?” The students initially started working independently, but after a reminder from Bruce, one student hesitantly asked the other, “So what did you get for number 21?”

Yet another way Bruce infused student collaboration into his lessons was through group problem solving. After Bruce had introduced a concept—usually through direct instruction—and provided a teacher-led demonstration or other activity, he often had students practice applying the skills by working together to independently solve related problems. For instance, to practice both the mathematics and conceptual elements of dynamics, Bruce asked students to co-construct a scenario, or word problem, using a (acceleration), m (mass), or f (force), three variables with which they had been working.

After helping students get into pairs or trios, Bruce walked to each table with a bucket containing slips of paper that had these variables written on them, so students might randomly choose one to create their problem. Bruce told his students, "Make the scenario as hard as you can, but remember, you have to be able to solve it." After each group had created their problem, students would compete to solve each other's problems for an extra credit point on the upcoming quiz. As students worked together to create their problems, Bruce circulated through the room, looking over students' work, answering questions, and validating ideas. While most groups worked in relative quiet, a group of three girls animatedly debated over the construction of their problem. "No, that's not, that's the distance!" one exclaimed. A second girl stood and leaned over her shoulder, peering at her paper. "No, here's what I'm thinking—you have to have the 'v_o' and the 'x_o,'" the second girl argued, referring to the parts of the first and second kinematics equation, which they had learned earlier in the year. "But if she's giving them 'a,' that's a two-step equation," responded the third girl. The second girl stamped her foot in frustration. "No, look! Think about it! It's gotta be three steps. They have to find 'v_o' first. Then they have to find 'a.' Then they have to plug that into that equation and—" "But we have to give them 'time,'" interjected the first group member, reminding them of yet another variable. This type of interactive student discourse, while appearing infrequently in my observations, was supported by Bruce's creation of opportunities for student collaboration and buoyed by his notions of democratic teaching, which I address next.

Democratic teaching. In interviews and lesson debriefings with Bruce in September and October, he stressed his desire to "share power" with students and teach

in a way that would foster democracy. He explained, “I have a very democratic classroom. I give them a lot of choices…I’ll open up the floor [and ask]‘How do you think we should do this?’” One way I observed Bruce infuse democracy into his teaching was an explicit negotiation of upcoming classroom assignments with his students as the class approached the final portion of the kinematics unit. Bruce wrote out the remaining topics on the board and explained to students that their collective task was to determine the schedule for the coming two weeks. Bruce added that although they would decide together, he had two “non-negotiables,” a quiz and a test, both of which had to be scheduled sometime during that period. After a short discussion, Bruce took a vote to determine how the next weeks would be scheduled and recorded the students’ decision on the board. In using this strategy, Bruce hoped that students would feel some ownership of the class while also learning to value everyone’s voice. He articulated, “I don’t want to be the dictator going, ‘This is how it’s going to be.’ I tell them, ‘These are my goals, this is what I want to do, these are the non-negotiables. How we get there is up to you.’”

Other than explicitly negotiating with students, Bruce considered his classroom organization to be a form of democratic teaching. Bruce noted that he imposed very few classroom rules because he wanted to create a democratic space where students felt comfortable speaking out and moving around, and he thought students would respond better in an unrestrictive environment. The lack of clear rules sometimes led to chaotic classroom conditions, with some students randomly out of their seats and others talking socially rather than attending to the task at hand. Because such a classroom environment did not fit the expectations of the new principal, who arrived in November, Bruce began

to feel tension between his notions of democratic teaching and having a class with "good classroom behavior" (by which he seemed to mean the principal's vision of an orderly class with quiet and obedient students). This dilemma increased as Bruce observed that students tended to cooperate even less when faced with more authoritarian models of classroom management. Speaking to the conflict he felt, Bruce reflected, "I know [democratic organization] doesn't enforce good classroom behavior, but…the choice is, reach them this way or DON'T reach them...it's a matter of picking and choosing your battles."

On one hand, the open environment of Bruce's classroom did allow for occasional autonomous student interactions, demonstrating the kind of student-led meaning making emphasized by the NUTR. For example, a collaborative problem-solving activity I witnessed on free body diagrams illustrated this type of generative, student-led learning. During a lesson I observed in mid-November, a pair of students spontaneously approached the board, having decided independently they needed to draw a diagram on a larger surface. Each student had a piece of chalk, and one sketched out the diagram while the other labeled the forces that were known. Debating the unknown variables, they discussed the problem until they had worked out a solution to their mutual satisfaction.

On the other hand, however, the nearly complete lack of rules or established classroom procedures had the potential to turn dangerous, especially during times slotted for independent student work. On one such occasion, I sat unobtrusively in the corner of the classroom, taking notes on my laptop as students worked on a cross-curricular project. Together with the art teacher, Bruce had crafted a multiple-day activity that involved

creating a plan for, and building a model of, a sustainable space station with a source of artificial gravity. Over the course of the class period, students traveled back and forth between Bruce's classroom and that of the art teacher, bringing various art and construction supplies for their model space stations. Bruce was circling from group to group, spending a few minutes checking in about the projects, which were due in two days. At this particular moment, Bruce was in deep conversation with a student on one side of the room, with his back to the rest of the students. I watched as a student entered with a can of paint and began trying to wrench off the top. After a few moments of unsuccessfully struggling to open the can, he looked around, and seeing a pair of scissors lying on the next table, grabbed them and tried to use them as a lever to pry off the lid. When this second attempt did not work, the student held the scissors upright and began smashing the can lid with the sharp tips of the instrument, trying to puncture the top of the can of paint. Frantically, I looked around to see if Bruce had noticed, but the din of student chatter drowned out the clash of metal meeting metal as the student continued to attempt to pierce the paint can. Finally, I waved for Bruce's attention and pointed at the student, and he went over and retrieved the scissors.

The four instructional strategies discussed above—experiential learning, learner-centered projects, student collaboration, and democratic teaching—were key components of the pedagogical vision developed by the NUTR, although Bruce chose the elements that he felt best fit his setting and students. While ideas from his preservice learning were visible in his practice, those ideas were enacted in either modified form—such as infusing

experiential learning through demonstrations accompanying direct instruction—or applied inconsistently, such as the occasional student-led project.

Negotiating with Students

Bruce's ability to enact particular practices was mediated by his negotiations with students, which occurred mainly indirectly because his students seemed to cooperate with him the majority of the time. That is, Bruce's students seemed to be willing to participate in the majority of his instructional activities, which engendered relatively smooth student-teacher interactions. As previously noted, Bruce's students had been attending the school for three years under the leadership of a principal who encouraged an open, democratic environment and valued active, hands-on instruction. This may partially explain the higher levels of student enthusiasm toward many of Bruce's activities and may also provide some insight into the ease with which Bruce developed relationships with his students (especially given his professors' concerns the year before regarding his interactions with pupils).

As discussed in the preceding section, many of Bruce's students showed enthusiasm, excitement, and curiosity about physics concepts. During demonstrations of phenomena, students clamored to be chosen as Bruce's assistant, literally jumping out of their seats to be able to shoot a Nerf gun alongside Bruce or otherwise help him create a visualization of a concept. Student enthusiasm for Bruce's physics class was also apparent from comments that often peppered lessons: "I love this class!" "I love physics!" or in response to an announcement about an upcoming lab, "Yay! I love labs!" His students also seemed to be genuinely curious and comfortable asking questions, shouting

them out freely during activities or direct instruction. For example, as Bruce introduced the concept of free body diagrams, student questions began as soon as the words left his mouth. “Today we are going to talk about free body diagrams,” he began. Immediately, students called out, one after the other, “What’s that?” “Is that physics?” “We’re gonna diagram my body?”

Beyond the general enthusiasm his students exhibited, Bruce’s cultivation of an open classroom space, student relationship building, and occasionally creative lessons seemed to be catalysts for student cooperation and participation in his activities, as will be discussed below. In the beginning of the year, Bruce professed his commitment to creating a classroom that had a “collaborative feel” to it. He told me that he had communicated to his students from the first day his beliefs about collaboration between the teacher and students, describing,

> Teaching is not so much about the teacher, it’s about the students, and not so much what we can do FOR students, but it’s really all about the students…they are the ones that run the class. They are the ones that dictate the pace, they dictate the general mood of the class, they dictate the level at which we go through, they dictate even the topic sometimes.

Although Bruce certainly struggled with the common teacher issue of straddling the boundary between freedom and authority, he generally found that his students responded positively to an open classroom environment and were more likely to cooperate with him than the students with whom he worked during his preservice internship. He articulated,

> My classroom management, actually, it's gone surprisingly well. The kids listen to me…And its, it's nice, because then, the students show respect for you and you show respect for them. It's a classroom of mutual respect, instead of, "Oh, I'm a lion tamer and here is my chair."

After the leadership change in November, under pressure from his new principal and school mentor to "improve classroom management," Bruce began to impose a more traditional behavior modification system of issuing "warnings" to students, followed by afterschool detention and a parent phone call as more serious consequences. He also realized that the lack of structure in the classroom affected his instruction. For example, in a debriefing session after a particularly rowdy class, Bruce reflected, "When I elicit observations about the demonstration, usually they just all shout out stuff. So I need to get a better system for that." Despite Bruce's infusion of more traditional classroom management tactics to appease his administrator and attempting to become more structured in his teaching, the class seemed to preserve much of the openness he had cultivated in the beginning of the year. In my observations through November, December, and January, students continued to speak freely in class, engaging each other and Bruce, and generally seemed comfortable in the environment that had been created.

The relationships Bruce constructed with his students also seemed to contribute to student cooperation with his instructional efforts. My observations showed that Bruce interacted with students in a friendly and open manner, and students seemed to genuinely like him. The nature of these relationships may have added to the enthusiasm students showed toward the instructional content of many of the lessons observed. This easy

relationship was demonstrated in numerous, casual classroom interactions. For instance, Bruce often checked homework while students worked on the "do-now." On one day as Bruce made his way around the room with his laptop, a student was rapping loudly. Bruce stopped in front of the student and listened, his head cocked to the side. "Is that the best you got? You need to work on your freestyling!" Bruce joked. The student laughed and, on the spot, improvised a few more rhyming lines about Bruce checking homework. During another lesson, Bruce drew a stick figure on the board to accompany a diagram. "Is that you, Mr. C?" Called a student. "Sure, why not?" Bruce replied. "Ooh! You have to draw your beard!" said another student. Bruce obligingly drew a beard. "You gotta draw your hat!" added a third student, referring to the yarmulke Bruce always wore. Bruce drew the disc perched on the stick figure's head. "You gotta draw your stomach!" said another student, rounding his arms out in front of him in simulation of a large belly. "Hey!" Bruce shot back, scrunching his face into a mock "angry" expression and wagging his chalk playfully as students laughed.

Multiple factors may have contributed to Bruce's ability to develop such relationships with his students. Bruce demonstrated that he cared about his students by going beyond his normal role as a physics teacher, such as working on extracurricular projects based on students' interests during his homeroom period, forming an afterschool drama club, and volunteering to step in as a substitute during a prolonged absence of the teacher with whom he shared a room. During the first few days of school, he also gave out his home phone number and personal email so students could contact him outside of school. In my first interview with him, Bruce said, "I actually have had two students who

have texted me so far. Which is cool! It's a lot more personal…actually showing that…you are not like, a robot." Opening these lines of communication helped Bruce connect with students outside the traditional confines of the classroom, and out-of-school conversations were often critical moments in relationship building. For instance, a student cursed in class at Bruce after finding out she was failing his class, and the principal suspended her for a week. In our debriefing session after the lesson, Bruce told me he expected that the student would have to "cool down" for several days upon her return to school before he could talk to her about the interaction. To his surprise, however, the student contacted him on her own through email before returning to his classroom. Bruce described,

> I got an email from the student, apologizing and saying why it happened: "I had a rough day, I was having a bad social day, I was having a bad day with grades in general, you are the last [class of the day] and you were just there. It's not against you, I feel really bad and I apologize profusely." I mean, she didn't use the word profusely, but it was a very meaningful apology, with an explanation…She was like, this is what was happening, I know it's no excuse, but I want to give you some background to let you know, this is how I feel about you. You just… got me at a bad moment.

Bruce explained that over the course of the week, he and the student had continued to exchange emails and texts, and he felt his relationship with her had changed by the time she came back to school. He also connected this event to a larger realization about the multi-faceted nature of his students' lives: "There's a lot more under the surface [with

students]. As a whole, it reminded me that, yeah, intellectually I know there's a lot going on with the students, but this made it more real."

An interesting development that may have also assisted Bruce's easy connections with students was the special relationships he developed with students who had a reputation within the school for being challenging, singling them out for leadership roles within the class. Edmund and Joy, two students who had been identified by the school as "troublemakers," provide an illustration. In my observations of Bruce's class, I noticed he frequently called on Edmund, a stoic, husky African-American student, to assist him with demonstrations of phenomena or help with classroom tasks, such as handing out materials for projects. Further, in the lab activity that I observed, Bruce deliberately gave Edmund a leadership role. After his group had shown Bruce their experiment plans and obtained his approval, he tossed Edmund a large automatic Nerf Gun, calling over his shoulder, "OK! Edmund's in charge!" Edmund was also in Bruce's study hall period, and Bruce told me about a project where they deconstructed and rebuilt a Wii together over several days during this time. According to Bruce, in his other classes Edmund was known as a resistant student who was constantly in trouble. During my observations of Bruce's class, however, Edmund tended to be a quiet student who seemed to take his leadership role seriously. Unfortunately, when I returned after the winter break to observe a final round of lessons, I noticed that Edmund was absent for all four lessons. When I asked Bruce why, he told me that the principal had sent Edmund back to his neighborhood school due to repeated behavior infractions in his other classes.

Joy was also labeled as a “trouble-making student” outside Bruce’s classroom. In Bruce’s class, however, Joy was the “star student,” often the first to volunteer to solve a problem on the board or join Bruce in demonstrating physics phenomena. Bruce explained that he thought she responded well to him because he “treat[ed] her like an adult, consistently.” Her comfort in his classroom was particularly evident on a day she was sent out of one of her other classes for a behavior infraction. Seeing her in the doorway to his classroom, Bruce came over and asked her why she was out of class. Joy explained candidly that she had “been disrespectful” to her teacher, and had been told to leave, but not specifically told where to go. Considering she had already had the physics lesson that morning, she implored Bruce, would he let her stay and help? Reflecting on the incident after class in our debriefing session, Bruce explained, “So she stayed and she was actually my teaching assistant. She would go around to tables, checking work, which is good because she actually has a very sharp understanding of the content.”

A final element that seemed to contribute to student enthusiasm and cooperation with Bruce was his occasionally creative approaches to lessons. Beyond the previously noted activities Bruce designed with his large collection of Nerf guns, a series of videos Bruce created for his students during the September Jewish holidays demonstrates this creativity. Knowing he would miss multiple days of school, Bruce created interactive, full-class-length videos for the substitute to play for the students. These videos presented content using various pop culture material. For instance, one video was created, as he described it, “in Cloverfield style” (the style of a particular horror film). As the video began, Bruce theatrically explained that the school had been attacked by Zombies—he

was trapped in the classroom, and the students had to save him by figuring out the trajectory he would need to fire his weapon and slay the zombies outside the door.

Developing Teacher Identity

My analysis of the data shows that Bruce's development of a teacher identity occurred parallel to, and was recursively influencing and influenced by, his construction of practice and negotiation with his students. The reasonably smooth interactions with students enabled Bruce to enact a teacher identity within the classroom he considered to be authentic and work with students in holistic ways that surpassed the narrow definition of "teacher of physics." Yet, Bruce's inclinations toward traditional aspects of teaching and factors in the school setting, such as the fear that he would not be rehired the next year, also produced more conservative facets of a teacher-self.

Being authentic. Bruce brought what he considered his "authentic" self to the classroom because he wanted students to get to know him on a personal level. Explaining the importance of "being sincere" with students, he remarked, "I get a lot of questions because I wear the yarmulke, I get a lot of questions about my collection of Nerf guns…students are also interested in who you are, so showing them anything else, they would be able to sense it." He liberally injected his lessons with his own hobbies, personal interests, and self-described "zany" characteristics. He infused his fascination for SETI (Search for Extra-Terrestrial Intelligence) and space travel into discussions and class projects, such as the two-week inquiry project where students researched and created a model of a sustainable space station with an source of artificial gravity. An avid gamer and computer enthusiast, Bruce often discussed online gaming and technology

with students during homeroom and study hall. He also shared his love of theatre by hosting an afterschool drama club. Bruce believed bringing his "whole self" to teaching (Taylor & Coia, 2009) provided a non-typical learning experience for his students. He shared,

> This works to my favor, because there's always that zany teacher that you absolutely remember, the nutty one, like, "I don't believe that he brought Nerf guns to class. I don't believe that we just threw eggs across the playground. Or that he rolled a bowling ball at me." And it makes it memorable because it's so out there, it's not just a typical experience, and I think that's how my personality fits in there. The personalities, they can't be bland, I don't know any successful teachers who have bland personalities. Kids will find it boring and uninteresting.

Treating his work holistically. Bruce also saw his teaching role as encompassing more than merely content area instruction:

> I only see it partially as teaching them physics, a lot less than last year—I thought [then], 'Oh, I teach physics.' It's a lot less teaching physics than being a guide, slash counselor, slash mentor, slash role model—it's a lot more of that, physics is just kind of the foot note.

Because he interpreted his job holistically, Bruce sometimes stepped out of the boundaries of his own subject for the benefit of his students. In one instance, his roommate teacher was absent for nearly three weeks without leaving sufficient lessons for the students. When Bruce saw that students were largely not engaged in learning during this time, and the parade of substitute teachers were not providing any kind of

useful structure for students, he volunteered to teach the classes until the teacher returned. This meant that Bruce taught nine periods in a row, which physically and mentally exhausted him, but he worried that without stepping in, the students might have missed out on several weeks of instruction.

Bruce also brought this more comprehensive understanding of teaching to his relationships with students, seeking to understand them not just as academic bodies, but also as individuals with histories and at particular developmental stages in their lives. He commented, "[The students] are people, with their own lives and problems." Viewing his job as a teacher through this more holistic lens sometimes triggered responses that may have differed from the norm. For instance, Bruce was absent one Friday, and asked the substitute teacher to administer a quiz in his absence. When Bruce returned the following Monday, he found that the class had cheated on the quiz. Upon investigation, he discovered that the substitute teacher had left early, without notifying anyone at the school, leaving Bruce's students unattended. Taking the entire situation in account, Bruce decided to re-administer the quiz with no penalties. He reflected,

> Our day goes longer than the district day, so I guess [the substitute] passed out the work and then left…[they cheated] flagrantly. But I don't blame them. There was absolutely no supervision. That's why I'm letting them retake it and not just giving them all zeroes. I'm not going to blame ninth graders for acting like ninth graders.

Being the traditional teacher. Despite the developments noted above, Bruce's traditional teaching beliefs seemed to resurface in his teaching at times. Such beliefs are

illustrated consistently in his assessment practices, which demonstrate an understanding of assessment consistent with more traditional models of instruction. Bruce gave frequent, formal multiple-choice and short-answer format tests and quizzes, sometimes as often as every two classes. These quizzes and tests constituted 65% of his students' total grade. Bruce explained that he was a "firm believer in one to two tests per week" to assess students' understanding—"because I really need to know where they are." During an early December debriefing session, I asked him why he relied on formal quizzes and tests as his main form of assessment. Bruce connected this practice to an incident from his internship year:

> What happened was, I was going through my unit, and [the mentor] said, 'You only gave one quiz the whole unit. How do you know they are getting it?' And I'm like, 'Oh yeah, they are getting it, I ask them questions, they seem to be displaying understanding, it's good. They can do the examples, they are doing fine.' They bombed the test! And [Mentor] is like, 'They seemed to NOT know what they were doing! And they seemed to not know any of [tested material]. So maybe you should assess them a bit more.' And I was like, 'Maybe I should.' That's why I got into the routine of giving quizzes.

With this comment, Bruce indicated that he interpreted his mentor's comments to mean that he should provide frequent summative assessments to make sure his students understood the material. This tendency also provides another example of the complex, entangled nature of teacher learning and its connection to teacher beliefs. While the NUTR program emphasized formative assessment and providing students with multiple

forms of demonstrating knowledge or proficiency, Bruce's meaning making with his preservice mentor may have been more consistent with his own beliefs about how students should show their learning and thus more likely to underscore his assessment practices in his first year of teaching.

With only forty minutes in each class, Bruce spent a significant proportion of time administering, returning, or having absent students make up tests, taking time away from instruction. The frequent testing also triggered negative sentiment in students, who frequently expressed their dismay at both the task of test taking and the power implications of being constantly tested. For example, toward the end of a quiz, Bruce announced to students that their time was nearly up. As students protested they were not yet finished, one student seemed to imply that Bruce reveled in the power formal assessment gave him over the students, asking Bruce, "You are enjoying this, aren't you?" In other words, Bruce's assessment practices positioned him in an authority role in opposition to his stated desire to teach democratically.

Another example of "traditional" beliefs about learning physics surfaced in his tendency to separate the procedural (mathematic) and conceptual aspects of physics. Bruce wavered between a traditional stance of dwelling on the procedural, isolated formulas and math skills that undergirded physics concepts like kinematics and dynamics, and an integrated approach that emphasized a strong conceptual, real-life connection to his lessons (a stance the NUTR had taught). Although Bruce professed his desire to teach in ways that integrated both the mathematic and conceptual physics components, his teaching often focused on isolated mathematical procedures, which he considered the

foundation for conceptual understanding of complex topics, an assumption that undergirds the traditional teaching stance where development is believed to precede learning (Walqui & Van Lier, 2010). For example, just before I began observing Bruce's main unit, he shared, "We are going to be doing a lot more of the cool conceptual stuff in physics." However, his second class in the unit was a full forty minutes of students working on isolated mathematic problems involving the use formulas associated with Newton's laws. When I asked him to explain how the worksheet related to the "conceptual stuff" he had mentioned, he responded, "The issue is, there *are* mathematics involved…there is still a lot of math, even in the conceptual. So this is just getting them ready for those kinds of problems." He also worried that integrating procedural and conceptual processes would do students a disservice in preparing them for collegiate physics classes they might study, which he believed would take the more traditional pedagogical stance of presenting information free of context and connection. He articulated,

> Most of the time the problem with …other stuff that they'll see in college, it looks like that, there's never a conceptual edge to it. 'There's a particle,' or 'An object is moving,' that's how all questions start. So once we are outside of the classroom, if another physics teacher will start, 'Did you learn,' and give them a problem, I don't want then to be like, 'What! What kind of object? What are we talking about here?' So it's a matter of, unfortunately, standardization, which is why I do that.

Playing it safe. Bruce admitted that in September, he began the school year with teacher-led, mathematics-driven lessons delivered via direct instruction, to "be safe"—despite the assurance of the first administrator that she supported inquiry-based instruction. In his first interview, Bruce shared that the original director had asked him to meet with her about his practices, and told him she had hired him because she wanted him to bring a more progressive instructional stance to the school. Explaining his reasoning for his traditional teaching, Bruce reflected, "I didn't want to…shake the boat. I wanted to [get into inquiry] gradually." The leadership change that occurred in November further influenced his unwillingness to "experiment" with non-traditional instruction. Because Bruce perceived the new principal as less inclined toward innovative practice, he reported, "I'm trying to stay in the safe zone until I get some actual feedback from [the new principal]." "Staying in the safe zone" meant teaching in more traditional ways, which Bruce thought "pleased the powers that be." He commented, "I don't think I can go as 'out there' when planning stuff. I can't just go, 'Hey! This is inquiry-based, let me try it and see if it works!' It's GOT to work."

His preoccupation with "staying safe"—which seemed triggered in part by his own traditional beliefs about teaching and further influenced by his interactions with the new principal—led Bruce to begin planning instruction based on his own ideas of how other PSI physics teachers in the district were teaching, although he had not been explicitly told to do so. In my final interview with Bruce in January, we had the following exchange:

Bruce: I would like to do it the other way [in a more inquiry-based way], um, but I want to be sure that they can get this mechanical stuff. I am still being compared with the PSI [Progressive Science Initiative] teachers.

Katie: Who is comparing you?

Bruce: I'm assuming that, for observations and whatnot, I'm going to be compared to the PSI teachers.

Katie: Are there any other PSI teachers in this school?

Bruce: No.

Katie: So who's going to be comparing you? Your observations are going to be done by your principal, right?

Bruce: True, but if the principal goes to observe another physics course, and they are like, oh, it's completely math, and oh, Mr. Cohen is completely conceptual…I don't want to do something so out there from the other physics teachers in the district. Already I'm going out there.

Katie: So what I'm hearing is that you want your class and your teaching to also match the other physics teachers in the district?

Bruce: So that there's not a discontinuity…there's not a, 'Well, they are teaching this, why are you teaching something completely different?'

Although there were no other physics teachers in the school, Bruce's interactions with his new principal made him fearful that straying from a more traditional physics teaching style, or veering too far from the scripted curriculum, would result in a negative evaluation, an action that could put his position in jeopardy. This worry influenced his

planning and practice, tempering his use of strategies learned in the NUTR and making it increasingly difficult to enact the pedagogies he had been taught during his preservice preparation.

As an illustration of this internal conflict, Bruce's intentions to share power with students and desire for an open classroom environment conducive to collaboration collided with his beliefs about his curricular responsibilities and worries about professional evaluations of his performance. Describing this tension, he related:

> There's always that, you want to give students the power, but you are afraid that if you give students the power in the classroom that certain things won't get accomplished…you want to give as much power to students as possible but you still have a lesson, an objective that you want to get done. And if you give it to them entirely can you trust them entirely to get it done? So now that I'm the teacher of record, it's hard to let that go. Because my reputation is on the line, my observations are on the line, everything is on the line.

Bruce's inner tensions about teaching in ways that aligned with his preservice program, discussed briefly above and elaborated in more detail in the next section, clashed with the teacher-selves he desired to enact with his students. These inner conflicts may have partially explained the inconsistent nature of his teaching. For instance, although Bruce strove to see his teaching as encompassing more than physics and his students as whole people, he was constrained by his tenuous position as a non-tenured, first-year teacher in the larger context of the school. This influenced, for example, his ability to advocate for his students by addressing the harmful "zero-tolerance" policies

with the principal. Although these policies contradicted his own professed democratic beliefs, he felt helpless in the face of concerns about his own professional survival. In response, he isolated himself from "the politics" of the school, stating, "There are a lot of politics going on. I don't know where I stand with anything. I like to stay out of that. I'm here to teach, I'm here for the kids, I like to stay out of the whole politics thing." Thus, while Bruce may have cultivated an identity within the classroom as a fun, somewhat madcap teacher who went above and beyond the role of a "physics teacher" for his students, in the larger context of the school Bruce enacted a much more conservative teacher-self. That is, his uncertainty about his position at the school and the new principal's assessment of his teaching, reinforced by his own traditional beliefs about instruction, contributed to a tendency to "play it safe" outside the classroom—a situation that created tension within the classroom as well.

Toward the end of December, Bruce revealed that he felt an even greater pressure to perform to the satisfaction of the administration, as the principal was considering at the time eliminating ninth grade physics and replacing it with another science discipline. Describing his fear, he commented, "The sheer—these are your administrators, and they can lay you off. If they choose that physics is no longer appropriate for ninth grade, then you are gone." By January, Bruce was even more on edge about his job security. In our last lesson debriefing, which took place during the second week of January, Bruce shared,

> It's fairly clear that she is uncertain about why we have physics in ninth grade…if she has to hire a new science teacher, she's going to look for one who could do

> either biology and environmental [science], because then they could do bio and environmental freshman year and they could get rid of me entirely.

Bruce's notions of teacher self seemed to be mainly influenced by three factors—the personal qualities and characteristics that he brought to his teaching, the vision he had for himself as a teacher, and the way he responded to difficult contextual conditions. The interaction of these three elements resulted in several contradictory identity enactments: being authentic with his students, interpreting his teaching role holistically, being the traditional teacher, and "playing it safe" instructionally and professionally. These enactments contributed to the development of multiple conflicting teacher-selves appearing inside and outside of the classroom, which may help explain the inconsistencies evident in Bruce's instruction. For example, Bruce's preoccupation with survival in terms of retaining his position at the school sometimes contradicted his classroom persona of a caring, zany, relatable teacher providing exciting learning experiences. These conflicting personas hint at the complexity of processes of teacher identity formation: during some lessons, Bruce appeared as a humanizing, creative educator, and in others he played the role of what he believed was a more traditional physics teacher.

Context Matters

As discussed above, from the start of the school year Bruce worried about straying too far from the dominant norms of teaching that prevail in schools. Although Bruce still attempted to put some ideas from his preservice preparation into practice, his tendencies toward transmission-oriented teaching combined with elements within the

school context to create insecurities about his enactment of the equity-oriented pedagogy to which he was exposed through the NUTR program. Specifically, I identified three contextual conditions that influenced his construction of teaching practices profoundly—school dysfunction and instability, a dearth of resources, and a lack of induction support.

School Dysfunction and Instability

Bruce's school setting was characterized by general dysfunction and instability. During my observations, his classes were frequently interrupted by bells from one of the other two schools co-located within the building, various adults, and other unexpected events. In a November debrief session with me, Bruce commented wryly, "My classroom is the one to interrupt." While perhaps this comment communicates his frustration with the frequency of the intrusions, rather than a reality that his class was intruded upon more often than others, my notes provide evidence of numerous classroom interruptions for various non-instructional purposes. For example, during one of the lessons I observed, the principal stopped Bruce's class during instruction to have a student give a public apology and deliver a warning about zero-tolerance discipline policies. In another lesson, the intercom buzzed on during an activity, asking for the teacher with whom Bruce shared the room. After querying Bruce as to her whereabouts, the office administrator did not shut off the intercom properly. Students were able to clearly hear her complaining to a colleague about the lack of organization within the school, prompting them to dissolve into hysterical laughter. In the lesson debrief following this incident, Bruce commented, "It's tough to keep a flow when you are interrupted so often…twice [per class] would be the average." Another day, a student

pulled a fire alarm. As a result, Bruce had to evacuate his students, losing approximately one half of the class period while the school was verified as safe to reenter. As we trudged down the stairwell on the way out of the building, Bruce turned to me and said, "This is every day. I can't get anything done. The intercom goes off, there is an evacuation, someone comes into class. *Every day*."

The school leadership change that occurred in November was also a major event that contributed to general instability within the school. Although Bruce had already expressed his worries about "rocking the boat" with non-traditional teaching strategies early in the year, the shift in leadership deepened his pedagogical conflict and inflamed his worries about his teaching performance. The outgoing and incoming school leaders had distinctly different views on leadership and instructional practice, and the new principal instituted major changes immediately. While the former director had cultivated a comfortable environment that allowed students freedom, Bruce thought it did not provide sufficient boundaries for students. As he explained "There wasn't really any disciplinary measures in place from [the founding of the school]…so [students] can get very, very rowdy…it's partially, if not entirely, the fault of the administration that let it go so far." Perhaps in response to this problem, the new principal made discipline her initial reform effort, rolling out a zero-tolerance plan that imposed stiff penalties for non-desirable behaviors, such as cursing, and required that teachers defer all disciplinary measures to her. Although Bruce agreed that some structures were needed to increase student accountability for maintaining an orderly environment, he disagreed with the principal's direct, no-excuses disciplinary approach. Bruce felt that the principal chose to

administer consequences to students categorically rather than investigating the circumstances surrounding individual disciplinary infractions, the latter of which he would have preferred had he retained the authority to do so. Describing this difference in philosophies, Bruce explained:

> [Principal] will just come in during my class and talk to them….[She will say to a student] 'I don't care what your grades are, I don't care about any of that. You will get the full consequences.'…I would have addressed, 'Why did this happen? How did this happen?' instead of jumping right into consequences.

During my observations of Bruce's lessons, I was present on two instances when the principal entered the class and stopped instruction to address disciplinary infractions. On the first occasion, Bruce had just begun his lesson when the principal strode into the classroom, accompanied by an African American student with braided hair, her eyes rimmed red from crying. The principal announced to the class, "Keisha has something she wants to say to Mr. Cohen." The girl looked up, her face tear-streaked, and quavered, "I'm sorry for cussing at you, Mr. Cohen." Bruce nodded in acknowledgement and thanked her for her apology. The principal turned to face the rest of the students. "Keisha is going home for the rest of the week. And that's what happens to anyone who disrespects a teacher." With that warning delivered, she motioned for the student to precede her out the door.

Bruce felt the penalties the new principal imposed on students were overly harsh. Discussing his disapproval of consequences meted out to the student in the above example, Bruce commented, "[The student] got suspended for an entire week. I can't say

I agree with that." He added, however, that although he disagreed with these decisions, he was not comfortable challenging the authority of the principal on behalf of his students: "I'm not going to disagree with my principal. I'm gutsy, but I'm not that gutsy." That is, given his position as a first year teacher, Bruce felt compelled to defer to the principal in her decisions to mete out heavy punitive consequences to students, despite his disagreement with them.

The authoritarian policies instituted in November by the new school leader also conflicted with the more democratic measures Bruce had attempted to cultivate in his classroom. While in the beginning of the year he had discussed his successes with "power-sharing" and negotiating assignments and activities with students, after the leadership change in November, Bruce felt forced to shift his focus from democratic classroom organization to more traditional management. To comply with the new principal's vision of what a "well-behaved" classroom looked like, he instituted a more authoritarian system of behavior modification that progressed from students getting a "warning," to having one's seat changed, to an afterschool detention (although because most students took the bus home, Bruce noted that detentions required the consent of a parent and finding alternate transportation for the student). The frequent suspension of students for disciplinary infractions that began to occur after the new principal's arrival also compounded the already high student absentee rates. This development complicated Bruce's teaching further because it meant that class material, quizzes, and tests had to be constantly re-taught or retaken.

Beyond instituting disciplinary reforms, the shift in educational philosophy and pedagogical expectations of the new principal also sent waves through the teaching staff. Although the new principal had observed Bruce twice by the end of the first semester, he had not received feedback from her because "she was too busy" (a situation which also violated the formal evaluation procedure of the district, which required that supervisors provide formal written and oral feedback and obtain a teacher signature within one week of the observation). The lack of insight about how the new principal perceived his teaching seemed to further reduce Bruce's already wavering confidence in his teaching. In multiple debriefing meetings after the leadership change, Bruce expressed his confusion regarding the principal's expectations for him, a situation that also fed his inclination to teach in ways he felt were "safe."

Many other teachers in the school were also shaken up by the shift, which occurred on the heels of a major change in the district's teacher evaluation system. Commenting on the instability felt by his colleagues, Bruce explained,

> You have a lot of teachers who were given really high scores by [former principal] being given inadequate or partially proficient by [new principal]…I just try and be cautious, that's what I try to do, in terms of the administration. She is getting a lot of the teachers, like, completely unhinged, in terms of their security in the school, in terms of…"I got a 'distinguished' with [former principal] and now I'm getting a partially proficient with [new principal].

In his interviews, by referring to "being cautious" and "staying safe," Bruce seemed to mean keeping his teaching to more traditional instructional norms and keeping his

students more “disciplined.” As he expressed, “I am just trying to stay in the safe zone until I receive some feedback from [new principal]. I know [former principal] seemed to be ok with it [more progressive teaching], but she’s retired.” As discussed in the previous section, Bruce soon discovered the new principal was considering restructuring the science course sequence, which further reinforced his desire to “stay safe.” Bruce’s lack of information regarding his performance, the uncertainties about his new principal regarding her pedagogical expectations, and insecurity surrounding his position for the upcoming year seemed to feed his internal conflicts and influence his teaching in ways that were more consistent with transmission-style teaching.

Dearth of Resources

The shortage of resources within the school was another condition Bruce perceived as a constraint on his practice. While science classrooms in the district usually shared particular features, such as sinks, cabinets to store equipment, and lab tables, Bruce’s classroom lacked these standard implements. As the school would be moving to another location the next year, no possibility existed of obtaining a classroom appropriate for conducting inquiry-based scientific activities. Further, Bruce reported, he lacked laboratory or physics equipment with which to create experiments or demonstrations of phenomena. He explained, “One of the huge limiting factors here is the complete lack of physics equipment.” Although when initially hired by the original NPMS director, Bruce had been told that the school would be purchasing new lab equipment and tables, this purchase never materialized. When he brought up the problems caused by lack of resources with his administration, he admitted, “I got laughed at.” The few labs he was

able to plan, he explained, “are invented out of stuff I already have [from home]…I have to actually build these labs from scratch.” To compensate for the dearth of supplies, he brought his own massive collection of Nerf guns, which he featured in two labs, and creatively used whatever was at hand in the classroom—a chair, a bowling ball, a towel—for in-the-moment demonstrations of physics phenomena.

Bruce’s classroom also lacked a stable Internet connection and had several power outlets in need of repair, but since the school was only temporarily housed in the building, the administration informed him there would be no investment in making improvements. Bruce felt these less-than-optimal technological capabilities seriously affected his ability to integrate technology into his lessons. For example, during an activity in which Bruce intended to show a YouTube video to introduce Newton’s three laws, the Internet was loading too slowly given the school’s weak connection. After fifteen minutes of trying various solutions, Bruce was able to use his phone as a “WiFi Hotspot” to show the video—but he had lost more than a third of his class period to the technological malfunction. After the lesson, Bruce commented to me, “You can know the technology and know it really well, like I do, but when push comes to shove and you don’t have electricity in half your classroom, it becomes difficult to use that technology.”

Lack of Induction Support

The third major institutional constraint, from Bruce’s perspective, was the lack of consistent and appropriate induction support. Since Bruce was the only ninth-grade science teacher, he experienced some isolation. He sometimes collaborated with the middle school teachers, but found working with them to be of limited use because they

did not share the same content area or have the specific challenges that came with teaching the advanced PSI curriculum. Although he was assigned a school mentor, a veteran seventh grade science teacher, the mentor rarely observed Bruce. When he did, Bruce reported the visits lasting only a few minutes. Bruce characterized his school-based mentor as very "traditional" in his teaching, and therefore unable to provide support with the type of inquiry-based activities promoted by the NUTR. Moreover, like the other middle school teachers at his school, Bruce's mentor was neither familiar with the physics content nor well versed in the particular requirements of PSI (the program was only for high school science subjects).

To complicate matters further, Bruce was not assigned a regular induction coach by the NUTR until nearly the end of November, three months into the school year. Discussing the support he had expected to receive from the NUTR, Bruce commented sadly, "I felt like I had been abandoned…I feel like I had been forgotten." The induction coach who was finally assigned in late November was a retired elementary school teacher. During our last interview, when I asked Bruce to describe his experience with his NUTR induction coach, he flatly replied, "Induction…has not been so useful." Bruce found this individual "not so useful" because like the school-based mentor, he was not knowledgeable about physics content nor did he understand the NUTR pedagogy. As a result, the type of feedback and support the coach could offer was limited. Being paid only five hours per week, with much of this time spent in meetings at the university, the coach had limited time to dedicate to Bruce. During one debriefing session regarding a multi-day inquiry-based lab, I asked Bruce if his induction coach had been involved in

the planning an/or implementation process in any way. Bruce answered that he had asked the induction coach to observe his lessons and provide feedback, but the induction coach "said he had a long meeting at [university], and that was his five hours [for the week]." Bruce also shared that the induction coach made it clear that he was only going to work those allotted hours: "He always tells me right out what's going to be his five hours for the week." From his experience with the induction coach, Bruce sarcastically explained that he had inadvertently learned a very informative lesson about teaching.

> When I went home and told this to my wife, she said, "Well, how do you think those kids feel when they get traditional teachers? I'm only available during these hours, and that's all that I'm going to be available…" So I actually learned something VERY valuable from my induction coach, completely unintentionally.

Discussion

Although students may be a critical element in the construction of teaching practice, Bruce's case illustrates that conditions outside the classroom can have an equal, if not larger, influence than conditions within. Bruce's account also demonstrates the profound influence that teachers' own beliefs and emotions may exert on the construction of their teaching practices. As shown in this chapter, the interaction of contextual factors—the school's dysfunction, a lack of appropriate mentorship support, and a dearth of resources—and Bruce's internal beliefs and fears resulted in practices that were mainly teacher-led, with inconsistent appearances of NUTR elements such as student-led projects and collaborative problem-solving. In the balance of this chapter, I return to key

rhizomatic concepts to offer insight into the normalization of Bruce's teaching and the complexity of enacting practice as a first-year teacher.

Normalizing Practice

Bruce's practice was influenced by both internal and external conditions that conflicted with his preservice learning and his stated intentions to continue to espouse an inquiry-based, socially-just pedagogy in his first year of teaching. Internally, Bruce persisted in his beliefs about more traditional forms of physics learning and assessment and wanted to avoid "rocking the boat" in his new setting because he feared being evaluated negatively by his principal and losing his job. When these initial internal conditions collided with multiple difficult circumstances external to him—such as a dysfunctional institutional environment, a drastic leadership change, and a lack of resources and mentorship support—Bruce responded by normalizing his teaching to more closely fit what he considered to be the standard for physics instruction in his district. Because Bruce was also at least partially committed to enacting aspects of the pedagogy he had learned in the NUTR program, this set of circumstance created conflict for him. The tension Bruce experienced manifested itself as inconsistencies and contradictions in his teaching practice.

The rhizomatic concepts of molar and molecular lines (Deleuze & Guattari, 1987) are tools for thinking about the decidedly non-linear nature of Bruce's development. From a rhizomatic perspective, *molar lines* are forces that stratify the world, "coding" people, places, and things into binaries that define the normal and perpetuate existing arrangements within institutional settings. In the context of this study, molar lines are

forces that normalize life in the classroom. While molar lines might appear as rules or structures imposed from outside, they simultaneously exist as internalized beliefs of actors within the setting. As Deleuze and Guattari note, “It's too easy to be antifascist on the molar level, and not even see the fascist inside you” (p. 215). Most teachers have deeply entrenched beliefs about teaching from their own school experiences (Lortie, 1975; Pajares, 1992), which can conflict with the more progressive pedagogies they learn about in their preservice programs (Cohen, 1988). This tension was evident within Bruce, who claimed that he was committed to principles of inquiry and democratic practice, but yet erratically implemented them because he was conflicted by performance-related fears and deeply ingrained beliefs about traditional teaching. These two factors—the persistence of Bruce’s traditional beliefs and worries of receiving a negative teaching evaluation—might be seen as molar lines, or normalizing forces, that moved Bruce’s teaching toward traditional instructional practices.

Several aspects of Bruce’s school setting could also be seen as molar lines. The disciplinary focus of the second principal, a lack of information regarding his performance, and insecurity surrounding his position for the upcoming year served as forces working to confine his teaching practice toward the more traditional norm of instruction. These uncertainties contributed to Bruce’s decision not to advocate for his students at the school level and to isolate himself from “school politics”—reinforcing yet another molar line, the idea that teaching is an apolitical activity (Cochran-Smith, 2004; Thomas, 2013). Finally, the lack of consistent and appropriate mentorship and resources represented molar lines supporting more traditional practice by contributing to Bruce’s

feelings of inadequacy with inquiry-based activities and precluding opportunities for continuing development of the type of pedagogy learned in the NUTR program.

The complex interaction of these elements meant Bruce was attempting to enact equity-minded practice in an extremely striated space with many molar lines. In other words, Bruce was attempting to teach in ways that broke from the status quo under very constraining conditions, both internal and external, hindering the ability to produce such practices consistently. Despite these normalizing lines, which caused tension for Bruce in negotiating with his new school setting and students and contributed to contradictions that emerged in his teaching practices, internal *molecular lines*—supple lines that can either reinforce the molar lines or become lines of flight that escape the status quo—were also evident. For example, Bruce was able to cultivate relationships with students, which he struggled to do during his residency year. He opened lines of communication and demonstrated trust by giving out his personal phone number and email, and took advantage of extra time in his day to get to know his students and their interests. He also was creative with the resources he had available, bringing in his collection of Nerf guns for kinetics and ballistics demonstrations and labs, which were met with student enthusiasm and excitement for learning physics. While these molecular lines did not consistently become lines of flight in Bruce's teaching, they contributed to the appearance of some elements of NUTR practice—albeit inconsistently.

The Complexity of Enacting Teaching Practices

Bruce's case also speaks to the complexity of the process of translating learning about pedagogy into classroom teaching practice. Like Mauro, Bruce was not able to

apply his learning in any kind of pure form. Instead, as Bruce transitioned to the classroom, he participated in a multi-faceted meaning-making experience that produced practices that evidenced both transmission teaching, as well as elements of the equity-minded pedagogy Bruce learned in his preservice program, and were mediated by factors encompassing his own beliefs and feelings, his students and their responses to his teaching, and elements of his school context. This multifaceted meaning-making comprised three interrelated processes: **enacting practice**, wherein Bruce tried to reconcile his preservice learning with own beliefs, his students, and school context to produce particular instructional practices; **negotiating with students,** during which Bruce explicitly worked with his students to gain their cooperation in classroom activity; and **developing teacher identity,** which entailed Bruce's construction and enactment of teacher selves that were shaped by his own deeply held notions of teaching, his evolving vision of what it means to be a "good teacher," difficult school contextual conditions, and ongoing interactions between and among them.

Thus, Bruce's case provides further evidence that teaching is not a linear, causal activity *done* by an actor (the teacher), but is rather a process influenced by a constellation of elements (e.g., the students, the teacher him/herself, the school context) that collectively co-constitute teaching practice (in rhizomatic terms, an assemblage). This finding parallels Opfer and Pedder's (2011) assertion about teacher learning, which they contend:

> …tends to be constituted simultaneously in the activity of autonomous entities (teachers), collectives (such as grade level and subject groups) and subsystems

> within grander unities (schools within school systems within sociopolitical educational contexts). (p. 379)

However, the elements identified above by Opfer and Pedder (2011) do not affect teaching practice uniformly. In Bruce's case, the strongest influences seemed to be his own internal beliefs and the difficult conditions he experienced within the school setting that reinforced his traditional ideas about teaching.

Chapter Six: June

The final case in this study focuses on June, a special education biology teacher. Like Mauro and Bruce, June's construction of her early teaching practices encompassed three processes—1) modifying principles of instruction learned from the NUTR to accommodate the new students and school setting; 2) working directly with students to gain their cooperation in daily activities, and 3) developing facets of a teacher-self. Yet relative to factors shaping her early teaching, June's experience more closely approximated that of Mauro in that her practices was influenced mostly by the day-to-day negotiations with students in the classroom as she worked to engage them in learning.

To give a context for the case, I first introduce June and the school where she taught. I then describe how June translated her preservice learning into practice, the way she negotiated with students for cooperation, and the teacher identity she developed early in her teaching career. I then discuss features of June's teaching context that exerted influence on her practices. I conclude by offering an interpretation of June's teaching from a rhizomatic perspective.

Background

June's Background

June was twenty-four, petite, and Caucasian, with a short cap of dark blond hair worn in a grown-out pixie, one side slightly longer than the other. A silver stud winked from her nose, and tattoos peeked out from underneath the sleeves of the conservative sweaters and retro-style dresses she often wore. June referred to the town where she was raised as "white suburbia," describing her upbringing as middle-class, conservative, sheltered, and dominated by her parents' devotion to the Christian faith. As she spoke of

her background, June laughed and gestured to her tattoos and piercings as she stated: “I wasn’t always like this—I was raised very religious.”

Despite living in a fairly homogenous area distant from inner cities, June developed an interest in issues of social justice, particularly those pertaining to science and the environment. She attended a small, private college in the Northeast, majoring in biology. As she neared the end of her undergraduate coursework, she decided to study dentistry and applied to several dental schools. While waiting for responses, she accepted a position as an assistant to a biologist working on a project in Tanzania, Africa. Obviously relishing the memory of the adventure, June described ten-mile hikes they had taken into the bush to identify animal tracks and the mud huts in which they had stayed. However, while in Africa she received some upsetting news. Due to an error at her college, her transcripts hadn’t been released, and her applications for dental school had not been considered.

Unsure of what to do upon her return home, June came across an ad for the Northeastern Teaching Residency and on a whim submitted an application. June confided that when applying she was not at all sure she wanted to be a teacher in Newark. Once she began teaching, however, June was “hooked.” The experiences in the program appealed to her sense of social justice, and she seized the opportunity to infuse her lessons with issues of environmental justice and ethics in science.

June excelled in the NUTR. By design, the program promoted the building of a network of relationships among faculty, school-based residency mentors, and the residents themselves. June embraced these community aspects of the program. She

specifically credited a good part of her success as a preservice resident to the close relationships she developed with several other residents. These connections, according to June, supported a collaborative environment for learning, and she talked of the benefits reaped from constantly sharing and building ideas about pedagogy with her fellow cohort-members.

Alongside the other residents, June studied socio-cultural approaches to learning, democratic forms of teaching and classroom organization, and inquiry-based approaches to designing lessons. Like the other residents, June initially struggled to make meaning of the residency's approach to inquiry, which blended a scientific approach to inquiry with a critical, social justice approach. That is, the NUTR's treatment of inquiry-based learning encompassed aspects of a Freirian problem-posing method (Freire, 1970), where the aim was for students to explore their own authentic questions about the world and construct personal meaning from those explorations. It also incorporated the notion of thinking as scientists do, such putting ideas to the empirical test (Windschitl & Thompson, 2006). By the beginning of her second semester in the program, however, June was creating and implementing learner-centered lessons that her professors considered exemplary. In fact, the faculty considered her to be one of the strongest graduates of the cohort.

Importantly, June's own beliefs about teaching aligned with the NUTR program's teaching philosophy. She explained, "I really bought into [the NUTR pedagogy], like all of it, from my core." She aimed to include an investigation or exploratory component in

every lesson as well as infuse constant opportunities for students to collaborate in meaning making. Her ideal lesson, as she described in her first formal interview, would:

> …get them to work together, to try to investigate this phenomenon, then from there to lead into some sort of understanding of the phenomenon…and then for them to produce something, at the end, using their new knowledge."

June also hoped to make her classes interesting and active, with "students moving around and discussing with each other and able to talk about content."

School and Classroom Setting

June accepted a special education biology position at Washington High School, a school located in a poverty-stricken, high-crime area. Although located in the same district as the school in which June spent her residency year, Washington represented very different context for her. During her preservice apprenticeship, June taught biology at a selective enrollment, arts-themed magnet school that boasted one of the highest graduation rates in the district, with a fairly homogenous population of students (mainly African American) and relatively few special needs students and English language learners, compared to other schools in the district. In contrast, more than a third of Washington's students were classified as special needs, the population was much more culturally and linguistically diverse, and less than half of its student body graduated within a four-year time frame. Washington also had a reputation for being one of the most challenging schools in the city. Notorious for outbreaks of violence among students and chaotic classrooms, the school had a suspension rate of more than three times the state average.

Several members of NUTR leadership and faculty were concerned with her decision to accept a position at Washington High School to teach special education biology. Not only did the challenging reputation of the school factor into their worries, but June would also be the lone NUTR graduate placed at Washington. Initially, the NUTR program had planned to place at least two residents at the same school to sustain the system of peer collaboration and support started during their preservice residency year. However, this plan had to be abandoned since some schools in the district, such as Washington, only had one teaching position available.

June herself was also initially hesitant to accept the position at Washington, although her hesitancy stemmed from the special education requirements of the position, not the reputation of the school or the notion of being placed without peer support. Before accepting the position, she met with the new principal of Washington, the science department chair, and the other special education science teachers, who all assured her they would offer the support needed. After these meetings, June became convinced that Washington was the best place for her of all options available (she was also offered a positions at a middle school in the district).

At Washington, June shared a room with another teacher who taught environmental science. The classroom itself was so large as to appear cavernous. Given small classes, June decided to only use the front of the room. The room was bordered on each wall by lab equipment, sinks, and cabinetry. Rectangular lab tables faced a slightly elevated black working station that ran nearly the width of the room, which June used in

lieu of a desk. Behind the working station were several white boards, which June used as a projection surface or to write notes and draw diagrams.

Leadership and support. June had multiple layers of support at her school site, including a school-based mentor, her department chair, other teachers in the science department, and a coach assigned by the director of the induction component of the NUTR to aid graduates during their first year of teaching. These sources of support did not necessarily provide the same level of assistance, however. June, felt her school-based mentor, another biology teacher at the school, was "non-existent" Because the mentor worked in a different building, June rarely saw her and had difficulty scheduling meetings or observations with her. Luckily for June, the science department chair informally stepped into the role of mentor (discussed in more detail later in this chapter). Beyond the personal support she provided to June, the department chair also helped build collaborative opportunities within the department, such as weekly professional learning community meeting (PLC) where teachers met and planned lessons together. Another source of support was the NUTR-assigned induction coach, whom June found helpful particularly with the special education aspect of her teaching.

Students. June taught five classes, each with no more than five students, all Latino/a or African-American. She described her tiny classes as both a blessing and a curse. On the positive side, having small classes allowed her to get to know the students on a personal level and gain an in-depth understanding of their academic habits, needs, and backgrounds. On the down side, because students were often absent, June was constantly having to review and re-teach material. In my first interview with June, she

commented, “It’s been really hard to move through material because you have to catch that person back up.” Further, June’s students tended to be reluctant to participate in active learning exercises, which June thought stemmed from a lack of confidence in their own academic skills.

Content. June taught biology in a special-day setting, an arrangement by which special-needs students were taught separate from their mainstream peers. Although her students were determined to need accommodations for learning that surpassed those available in an inclusion classroom, June co-planned with her general education science colleagues and followed the same curriculum sequence. During the lessons I observed in September and early October, June spent time working with the students on scientific inquiry skills and related language as well as the scientific method. The full-length unit I observed in late October and early November focused on biochemistry, with students investigating molecular and atomic concepts and processes relating to organisms. In my final observations, which took place in December, June’s classes took part in activities about macromolecules, mainly focusing on the four kinds of “biopolymers”—nucleic acids, proteins, lipids, and carbohydrates. A more detailed chart of June’s lessons can be found in Appendix A.

June’s Teaching

In this section I discuss June’s teaching, giving attention to her day-to-day interactions with students and ongoing construction of practice. I first examine how June enacted instructional methods she had learned during her preservice preparation, attending to how she modified them to meet her students’ needs. I then detail the

intensive, varied negotiations she engaged in with students to gain their cooperation in daily activities. Last, I explore the development of June's initial teacher identity, which both informed her teaching practice and student negotiations but was also informed by these processes.

Enacting Practices Learned in Preservice Preparation

During the first several months of teaching biology at Washington High School, June used several practices she had learned during her preservice residency year, albeit in modified forms to fit her students and setting. Specifically, she incorporated teaching through inquiry, scaffolded scientific literacy, differentiated instruction for her students, connected the content of her lessons to students' lives, and provided alternate forms of assessment. Below I detail how June tailored these principles of instruction to her special education students.

Teaching through inquiry. June considered inquiry to be a cornerstone of her teaching. Explaining her emphasis on this instructional method, she commented in her first interview: "I am always trying…whatever lesson I make, to do something that is inquiry-based, to have some sort of investigation, and so far I haven't had one class where that isn't the case." In an interview following the last lesson in the full unit I observed, June again emphasized, "I try as much as possible to get [inquiry] into every lesson. Something where [students] don't know what they are doing at first, but they are going to figure it out, and hopefully they are going to figure it out on their own." These assertions were consistent with my observations. Nearly every class contained some investigative component, ranging from short "do-now" explorations to experimental labs

requiring students to pose questions and hypothesize about phenomena, collect and analyze data, draw conclusions, and share their findings. For example, as an introduction to the concept of an atom, June gave each student a piece of tin foil and asked them to hypothesize how many times they could rip the foil in two, until it was too small to tear further. After students predicted the number of tears and then performed their task, June introduced the idea of the smallest unit of matter—the atom.

Because this investigation was designed only to introduce a concept, the task was only about five minutes in duration. Other investigations, however, were much longer, allowing students to engage with the full process of the scientific method. For instance, when I observed a lesson about the properties of water molecules, students conducted an experiment demonstrating concepts of adhesion (the property of molecules of different substances to cling to each other) and cohesion (the property of molecules of the same substance to stick together) by collecting water droplets on the head of penny. June provided students with a graphic organizer that contained guides for each point of the process, with boxes prompting students to conduct observations, record the question driving the experiment, generate a hypothesis, record their data, graph the information collected, and write conclusions. For this particular experiment, June provided the question—"How many water droplets fit on the head of a penny?" With June's guidance, students created hypotheses and conducted three trials, averaging them and recording the data. Next, June posed an additional question: "Will you get more or less drops [of water] on your penny if you dip it in dish detergent?" Students repeated the procedure after dipping their pennies in dish soap. After recording the results, June helped them

create a graph to visually display the data and asked them to theorize about what had happened. For each part of the lab, she likened their work to that of scientists: "The reason we are doing this…scientists always graph their data." "OK, the last thing I want you to do, we have to do some writing because we are scientists and we have to write up our conclusions."

June also emphasized the "why" component of experiential learning, explaining to her students, "Scientists always need a reason *why*." The last step in June's labs normally called for students to explain their thinking. For instance, after observing a demonstration that provided an example of surface tension, June asked students: "I'm going to ask you *why* what happened, happened. And don't just repeat what happened…I want to know *why*." During another experiment, students dipped detergent-coated fingers into a flat pan of water with a surface coated in pepper, and many exclaimed in surprise as they saw the pepper scatter, as if by magic. "So that was exciting," June told them, "But there's a reason why. Why did the dish detergent make the pepper go away?"

Scaffolding scientific literacy. June recognized that her students needed scaffolding in scientific literacy (Villanueva & Hand, 2011), or targeted support to appropriate specific language use and skills associated with the discipline of science. To meet this need, she infused her lessons with explicit opportunities for students to apprentice into the processes and language of scientific inquiry by providing graphic organizers that scaffolded each step of the inquiry process and emphasizing the language and skills of scientists. June's scaffolded support during an investigation demonstrating the breaking of molecule bonds serves as an example of this practice. In the activity,

students observed, hypothesized, and theorized about the outcome of placing M&Ms in a cup of water. To begin the task, June had the following exchange with her students:

June: What I need you to do: open your pack of M&Ms, but only to look at them. In the first box, what does it say [student name]?

Student 1: Observations.

June: OK, so what I want in the first box is objective observations. Should anyone write, 'M&Ms'?

Students: No.

June: OK, good…So right now you need three objective observations. (She checks with students as they write) What do we have here?

Student: Plastic cup of clear liquid.

June: OK good…all right, if you have done the first step, what I want you to do now, the second step of the scientific method—

Student: Questions!

June: Right! What I want you to do is put some questions you could do?

Student: Why are all the M&Ms different colors?

Student: Why are there M's on the outside?

June: Let's see if we can come up with a question that involves the water and the M&Ms…

Student: What would happen if we put the M&Ms in water?

> June: All right! We are starting to think like scientists, you guys! (*June crouches down at a table to work with a pair of students*.) So what would you predict if you did an experiment with this question?

June also noticed that her students had difficulty with scientific terms and vocabulary, and she tried several different strategies to help them learn specific terms. After one class when students had a particularly difficult time differentiating between independent and dependent variables, June lamented that while students seemed to understand conceptually what the terms *meant,* they did not seem to connect those understandings with the actual scientific term. She explained,

> I had them do an experiment and told them what those [terms] mean…and then we did another lab where they were identifying the variables again. But I don't know any other way now, like I mean, other than 'Just memorize these words.' They are good at the hands-on, they get like, 'What I do here is going to affect what I do there. Oh yeah, that's obvious, Ms. Lake.' Well, they have names, it's called THIS. That part is the disconnect.

To help students learn unfamiliar and perhaps intimidating new words, June began teaching students to dissect words and recognize roots and suffixes. She told her students, "Remember, if you don't know what a word means you can break it down," adding, "What word do you see in *surfactant?*" In another instance, when introducing cohesion and adhesion, she asked students, "What does ad- mean?" A student guessed, "Like to add something?" Another strategy involved creating a section in student notebooks serving as a "dictionary." June told the students, "This is going to help you understand

things we learn in different ways." On each page, she had students draw a line dividing the paper in half. On the left side students would record the word and the definition, and on the right side they would write a way to remember it, such as using an analogy, a summary in their own words, or a picture.

Differentiating for multiple needs. June was purposeful in planning every lesson, ensuring that each ninety minute period included as many learning modalities and supports as possible. Some sort of guiding organizer, visual materials, hands-on tasks, manipulatives, and/or different forms of media accompanied each activity. Offering varied forms of content representation and having several activities planned not only offered students multiple ways to engage with scientific ideas, but also gave June room to adapt to her students' needs "in the moment." As an example, in one lesson exploring the structure of a water molecule, June had designed an interactive video assignment, asking students to use a graphic organizer to identify information in the video. She instructed students to tell her to pause the video when one of the topics arose, but they refused to participate. After stopping the video a few times herself and unsuccessfully eliciting answers from students, June cut the activity short and moved into the next activity, an experiential lab. After the lesson, June reflected, "I saw that I was losing them…I immediately saw like, they were either too tired or, I need to do something where they are being active." In this case, planning for multiple activities of different types allowed her to change gears to engage the students more effectively.

June also adjusted her lessons specifically for the needs of each of her classes. As she explained, "Some classes have assignments that others don't…there are different

types of learners and needs." At times June would adjust both the content and teaching methods, as in the case of her fifth block, B day class—a class of five boys—where she modified her teaching by actually sitting with them in a group and working alongside them (rather than rotating among pairs or triads of students, as she normally did). June also refined the scientific concepts they studied together, focusing on the big ideas and eliminating information she did not consider central to each topic. June commented, "[In my fifth block] we move through material slower, so I've definitely cut out pieces with them, but I've tried not to cut out anything significant, I think." Although her lessons may have varied from class to class, June reflected, "I see that each class plays out differently, but yet they are all accomplishing the same goal."

Making connections to students' lives. To further help her students understand scientific concepts and terms, June made connections between the instructional content and their lives, allowing them to build on personal experiences to make sense of new ideas. To establish such linkages, June often drew analogies between ideas or situations familiar to the students and the learning at hand. For example, when discussing acids and bases, she asked students to consider their experiences with acidic foods: "Have you ever eaten so much pineapple that your lips burn?" To make a concrete connection to the abstract idea of water molecule bonds and adhesion, June queried, "Have you ever been drinking a drink and you can't get that last sip?" When students nodded, she explained, "That's because the water is actually bonding to the surface of the glass. It's no longer bonding with its molecule water friends, it's bonding with the surface of the glass, and that's adhesion."

To forge productive connections for students, June had to occasionally reframe her analogies several times to find a particular entry into a concept. That is, she sometimes had to verbally negotiate the meaning of the connection she was trying to make to students' lives before they would grasp the point. During one such incident, June attempted to draw an analogy between a cell and a factory, asking several different variations of the question before her students finally understood it. Reflecting on the process of "pulling her students in" through these connections, June explained the challenge as follows:

> I must have asked a question eight times. 'So you know, the cell is like a factory. What is a factory?' No one, no one. 'What's a factory that makes things?' No one, no one. 'You know what could be produced through a factory? A company. What company could make something?' No one, no one. 'So [student's name] what brand of shoes do you have on?' 'Nikes.' And I was like, 'What do you think the factory is called that makes your shoes?' He's like [in a voice that portrayed the student's scorn]'Uh, the Nike Factory?' 'THANK YOU! Now let's continue with the analogy.'

June also created lessons that were relevant and meaningful for students' lives. After observing the impact of water on M&Ms, the students were given a homework assignment to write down all the ways they used water over the course of one day. As June explained, the intent of this assignment was to help the students think about an explanation for the reason the M&M's color faded in the water. By recording activities, such as brushing their teeth and washing their hands, June hoped students would

recognize that water has a solvent property—that is, water can dissolve certain substances—which she then would connect to their in-class learning. In another example, just before Thanksgiving, June collaborated with another science teacher to create "The chemistry of Turkey." Using the framing question, "Why does eating a lot of turkey make you sleepy?" students investigated the soporific chemical Tryptophan, which would likely be found in the main course of their holiday meal.

In late October, "Superstorm Sandy"—a combination hurricane and snowstorm—hit the coast, destroying homes, flooding towns, and knocking out power to a large portion of the northeastern part of the United States. The students' return to school coincided with June's department chair's request for all science teachers to practice graphing in their lessons, because it was a central skill in an upcoming "Criterion Referenced Test" (a type of test using particular criteria to measure aptitude with a particular set of skills or body of knowledge). To provide a contextualized lesson that integrated graphing, June designed a two-part lesson that used data from the state utility company to plot the number of people, county by county, still without power from the storm. In the second part of the lesson, she guided the students through an exploration of the following question: "Do you think income level determined which counties had their power turned on first?"

Assessing students in alternate ways. In the beginning of the year, June reported that formally assessing student learning during written summative exams was one of her biggest challenges. Although her students had demonstrated understanding of concepts, such as the steps and purposes of the scientific method when she formatively

checked for understanding in class, upon administering the first formal, written test, students performed poorly and several refused to answer the test questions at all, claiming they did not know the answers. To build student confidence and circumvent the resistance that appeared at the mention of a "test," June planned her next summative assessment as a "practicum," a term June used for a performance assessment that gave students multiple opportunities to demonstrate their learning in different ways. This particular "practicum" asked students to move from station to station completing various activities. At one table, students watched a video about a severe stroke victim on June's iPhone and completed a related written prompt about Bioethics. At a second, they identified objective and subjective statements about materials for an experiment. At a third station, students selected photos to identify characteristics of living and non-living things. In the final area, they consulted a set of materials to design procedures for an experiment. Before giving the practicum exam, June commented to me, "They are not going to know it's an [formal] assessment, until they are done. And then I'm just going to tell them that they just took their test."

As she indicated in her first interview and subsequent lesson debriefs, June believed that many of her students had internalized the label of "special needs" and lacked confidence in their academic abilities, which often resulted in "shutting down" or refusing to engage in particular academic tasks. I observed that such student response was particularly acute during summative or "high stakes" assessments. When a student "shut down," June simply tried to find other ways to help him or her, either by modifying the section of the exam with which the student was struggling, rephrasing her questions, or

further scaffolding his or her work in some way. For example, when students were unable to complete a section of a formal assessment that asked for the definition of terms relating to the scientific method, June wrote the definitions on the paper and asked them to match the word to their definitions. On a portion of the previously described performance assessment, a student balked at writing a detailed answer to a prompt that asked for a description of how a media clip about euthanasia related to bioethics. In the lesson debrief following the interaction, June theorized that the student's refusal stemmed not from lack of knowledge but from lack of confidence in his ability to express himself in writing. To help the student, June asked him to explain the answer verbally while she wrote it down. Describing the interaction with the student, June shared,

> I said, 'Can you give me more…' And he was like, 'I can't.' And I was like, 'What if you tell me, and I write it?' And he's like, 'OK.' And this is word for word what he said, and I'm not even kidding: 'There is no cure. He can't move anything on his body. If he lives, he will suffer more. But if he dies he will be in peace with no pain. He should be allowed to die.' And I looked at him, and I was like… 'What you said was beautiful.' And he was like, 'Really?' And I was like, 'Yeah… 'We'll do this, but let's work on bits and pieces of getting you to be able to express your thoughts.' And he was like, 'OK,' and I saw emotion from him, like sincere emotion, for the first time.

During summative assessments, June sometimes worked with students in tandem, encouraging them and redirecting them when they became tired or disengaged (a process I discussed in more detail in the next section). For example, during an assessment on

graphing, one student laid her head down on the desk, splaying out her arms, her pencil rolling across the table. June came over and sat down next to her and said in a low voice: "Come on [student's name]," pointing to the passage where the student had left off. "Let's read this together. Read the first sentence to me?" By designing her assessments as practica, or more authentic performance-based tasks and working together with students, June was able to help them experience success in "testing" situations.

The science department at Washington High School had developed a series of common Criterion Referenced Tests (CRTs), which every student in each science class was required to take at designated times. Designed to pinpoint areas of science skills and knowledge in which students were weakest, the criterion-referenced tests were created both to inform teachers' instruction as well as serve as a predictive measure for the spring standardized tests taken throughout the state. June was not invited to collaborate on the development of the first iteration of these tests, and she explained to her department chair that her students were likely to shut down when faced with three pages of tiny font and concepts they had not yet studied in class. Although not permitted to adjust the actual format of the test, June did convince the chair to allow her to enlarge the font and provide particular accommodations for her students, such as having her read portions of the text and reframing questions when needed. Although the department chair also required teachers to enter the test as a class grade, reasoning that students would be more likely to try their best if the test "counted" in some capacity, she did not specify how they should be graded. June told her students that for their grade in her class, she would count every problem they attempted, whether their answers were correct or not. That is, although the

science department would tally her students' actual scores for their own information, for the purposes of her class, June only graded them according to their effort on the CRT. Once the high stakes were removed, June reported, "The students actually try." After the end of the first semester, the data for each class's tests were collected, averaged, and compared across each class in the science department. June was ecstatic to report, "My students scored the highest out of every class."

To summarize, June was able to translate several principles of instruction learned in her preservice preparation program into her first-year setting. In other words, she was able to take particular pedagogical abstractions from her preservice program and modify them for her specific student population. She infused inquiry-based teaching—a major element of the NUTR program—through frequent investigations, questioning, and exploring the "why" of scientific phenomena. She apprenticed her students into discipline-specific uses of language by scaffolding scientific literacy and language, and differentiated her lessons in both content and method according to the specific needs of the students in each class. She actively sought to build bridges between students' lives and the content they were learning, forging links with questions and analogies in the moment as well as deliberately planning lessons that were framed by ideas with which students were familiar, such as the turkey lab or the Superstorm Sandy graphing exercise. Finally, she modified her assessment practices, working to provide performance-based experiences that were interactive, supportive, building students' confidence in their academic skills and in turn, increasing their willingness to engage in tests that had a more traditional format (such as the department-mandated Criterion Referenced Tests). The

actual day-to-day enactment of these practices, however, depended largely on the positive responses of June's students to her instructional moves. June sought to ensure that her students responded in productive ways through various, extensive negotiations with them in each class. Those negotiations are discussed next.

Negotiating with Students

Of all the influences on June's first-year teaching practices, the moment-to-moment interactions she had with students seemed to be the strongest. That is, to enact the practices she envisioned June needed to work hard to engage her students in the instructional task she had planned for them. Because the students doubted their academic skills, getting them engaged in learning was not easy. To secure the students' cooperation with daily activities, June built relationships with them, offered frequent encouragement, used various incentives, and provided transparency and rationales for her actions. These strategies are described next.

From the beginning of the year, June cultivated relationships with the students that gave her some leverage to coax them to participate in instructional activities. She commented, "I'm trying to build a relationship where I respect my students, and instead of trying to motivate them with, like, a negative…[I'm] trying to tell them that they are intelligent, and capable, students and people, and that's why I want you to work hard, not because I say so and you need to do it." Aware that her students were marginalized within the school by their special needs label and considered "problem" students by some teachers, June made a special effort to treat them in humanizing ways. For example, during my observations, if a student had his or her head down, June would check to make

sure he or she was feeling well before encouraging him or her to take a more active role in the lesson. June regarded this sort of "checking in" as a way to connect with students. As she commented, "One of the biggest deals…[is] making an effort to reach out to kids on a personal level and figuring out…what their background is, and why they are depressed, and that's going to help you in the long run, instead of screaming at them when they are not listening. That's not going to work."

June's relationship with a pregnant student in the second period (A day) class provides another example of her relationship-building strategy. Instead of ignoring the young woman's pregnancy and focusing solely on academic work, June planned a baby shower on her last day of school before leaving to have the child, a girl. June bought the student a gift wrapped in pink paper and surreptitiously had all students in the class sign a card as a surprise. After finishing their first class assignment for the day, June announced, "We have to continue with our work, but let's take a few minutes and have a mini-celebration for [student]." June presented the student with the gift and class card, and another student doled out pieces of a homemade cheesecake she had brought for the occasion. At the end of the period, June gave the student a biology book and several assignments, hugged her and said that she expected to see her back after the baby was born. Instead of ignoring this student's condition as a topic not appropriate for discussion in school, June showed her and others students that she was a valuable member of the class community.

Another strategy that helped June build relationships with students and gain their cooperation was to adopt a proleptic view of them (Vygotsky, 1978). That is, she acted as

if students were capable of the work she demanded of them. June illustrated this belief by consistently providing encouragement for students before, during, and after activities in which they participated. June might preface a challenging activity with a statement stressing their capabilities: “I need all your brainpower for this,” or “I need your intelligence here.” In other instances, if students were not participating in the desired manner, she would often remind them of previous stellar work they had done to spur them to action: “What’s going on? You were ON FIRE last class!” If students became frustrated during an activity, June would remind them of their abilities, telling them, “I know you can do it,” or “Stop acting like you are not smart.” After successfully completing a task, June reminded them of their brilliance, which she was aware of all along. For example, as students wrote their conclusions to an experiment regarding adhesion and cohesion, June told them, “See, I told you are geniuses!”

As students built relationships with June and experienced success in her class, they began to come to her classroom during other than actual class time. They often arrived early in the morning to talk with her or spent their lunch in her room, working on homework or finishing class assignments. As an illustration of this relationship development, June described an incident taking place during a Professional Learning Communities (PLC) meeting in her room. Speaking to her colleagues’ shock to see her students willingly congregating in her classroom, June related,

> I had about eight kids in at once, doing work, and that’s like, unheard of at Washington. And everybody was like, are you *paying* these kids to come in here? Because [the students] all walked in right at the end of the PLC [Professional

> Learning Communities Meeting]. So everybody saw them waltzing in, and they were like, 'OK, what do you want us to do, Ms. Lake? Where do you want us to sit?

As June became more confident of her relationships with the students, she strategically leveraged her connections to involve them in lessons. For example, June's all-male fifth block, B day class, according to her, had a "terrible reputation" in their other classes. Because of the relationship she had developed with the boys, however, they cooperated with her. She remarked, "They've said it verbally—'I'll do it, but only for you.'" The impact of the mutually caring relationship June had developed with the students was illustrated during a particularly difficult day in her fifth period. After trying to get the boys to focus on the task at hand with little success, June left the group and sat on the floor behind her desk, out of their sight. Worried that they had made her upset, several boys sought her out to make sure she was okay. Discussing the incident, she related,

> So I just sat in the back over there [behind the teacher's desk] until they were quiet…I think they were very concerned as to if I was crying back there or not. [They] walked behind the desk, and…they were like, 'Are you OK, Ms. Lake? …We are sorry, we will start doing work.'"

June also bargained with her students, explicitly negotiating for their attention and participation in instructional activities by using incentives. For instance, she frequently promised students free time at the conclusion of class periods if they focused on their work for the majority of the session. Throughout the class she would remind students

about the agreement. One day when a student had her phone out June told her, “Please put that away. If it’s a really important text you can do it in the last five minutes of class.” In her last period of the day, she reported nearly always giving her students the last fifteen minutes of the period for free time. She explained, “They are about to pass out from hunger, or tired, or whatever, so I know I can’t push them to the very end.” June felt this was an effective strategy that actually made the use of class time more productive. She explained,

> I don’t think it at all diminishes the point of the lesson…If you can get 70 minutes of good instruction with the students, and you can negotiate that 20 minutes, maybe ten minutes in the beginning and ten minutes at the end, where they might have time to themselves…because once you do that they’ll give you their one hundred percent for the other parts.

June also used grade incentives as a negotiating tool. When students provided a correct or well-thought out answer, June would often respond with “A plus!,” signaling that their grade for the day would be the highest possible. In another class, June pointed out to a student who rarely came to class that he was receiving 100% for the day, to which the student responded with a wide smile and renewed concentration to the task at hand. In other instances, June used the threat of a failing assignment grade to obtain a desired response. For example, she asked a student who had missed an assessment to come to her room at lunch to finish it. When he resisted, she said, “So you would rather take a zero?” When he shook his head, June said, “Great, so can we have lunch?” Halfway through another class, a student put her head down on the desk, groaning, “This

is so much work!" June said, "This is the only grade for the class. You can get a 100 or you can get a 50 because you've done half the work. So which is it?" The student raised her head, answering, "100," and picked up her pencil to continue the assignment.

June also strove to be transparent with her students, providing rationales for classroom activities and decisions. She described her philosophy as follows:

> I'm going to have these responsibilities, I'm going to do this and this, and in turn, I want you to do these things, but there will always be a purpose. And so I've had students already, like, like they will realize…like everything I give them to so I say that there is a reason behind it, and I think that has been huge too, because they know that they are not just doing meaningless work.

In the very first lesson I observed in September, June prefaced her initial assignment by telling the students, "Everything in here has a purpose." This theme was evident in the subsequent lessons I observed as she often explained her reasoning for planned instructional tasks and ongoing classroom decisions. For instance, when students balked at a graphing assignment in November, June explained, "So the reason we are doing this—don't get mad at me—one, scientists always graph their data. And two, the science department is giving an assessment that everyone has to take that has graphing on it." She also provided explanations for the particular social rules she expected students to follow. For instance, when one student cursed at another, she explained her "no profanity" rule to the class by saying: "Here's the reason [for the 'no profanity' rule]—I want you to treat each other with respect." By providing the students with specific purposes for

classroom rules and assignments, she hoped they would be more willing to "buy in" to the norm or task.

As June spent more time with her students, she began differentiating her negotiation strategies, learning that what worked with one student did not necessarily work with another. Some students responded consistently to a particular incentive or strategy, and thus she could rely on a specific tactic to work the majority of the time. By way of example, June explained, "[Student's name] responds really well to feeling successful. So if she feels that she's doing a great job, or that she's really smart, she'll keep pushing herself." When working with this student, June would continually remind her how well she was doing during class activities. She also maintained frequent contact with her mother, texting her often about the student's accomplishments. Other students were not as predictable, but she used her knowledge of them to determine a course of action. For example, she recognized that another student's needed to be in constant motion, and modified her instructional plans accordingly. During a class exploring the structure of water molecules, June named the student her assistant, directing him to draw accompanying visuals for the lesson and make appropriate notations on the board throughout the class. Explaining her thinking with regard to engaging the student in the learning activity, June articulated, "He can't help it, he needs to be moving…so who did I have at the board the entire time? [Student's name]. 'Can you write this, can you draw this? Can you do this?'" As June learned more about her students' needs and strengths, she was able to individualize her teaching strategies for them and achieved higher rates of

participation in instruction, which in turn supported her enactment of practices that were learner-centered and involved cognitively challenging tasks, like scientific reasoning.

June's negotiations with her students were not always successful. Her responses to these instances, however, might still be considered breaks from the norm, as illustrated by her reaction to a student who refused to participate in a particular activity. The student sat with her head cradled on top of her arms, eyes closed, not responding to June's endeavors to engage her. After several attempts to bring the student back to the lesson, June said to her, "You can't have your head down. If you don't feel good, you can go to the nurse." In response, the student released a string of epithets in Spanish. "Don't curse at me in Spanish. I would never do that to you," June responded. She then asked the student to choose between participating in the group activity or working individually on a textbook activity. "You can either participate and do this lesson, or you can do the chapter on chemistry in the back of the class. Your decision—what would you like to do?" The student remained silent. "So by not participating now, that is the option that you are choosing, and I'm going to grade you on that today," June stated, indicating that with her refusal to participate, the student was opting to extract herself from the active learning task and instead complete an alternate textbook task individually. After the exchange, June retrieved a book, found the appropriate chapter, and gave the student an assignment to complete in the back of the room (which she did not do). While June was not successful in getting the student to participate in the lesson, she still communicated her respectfully, saying, "I would never do that to you." She also provided an alternate assignment that kept the student in class, rather than sending her to the office or to

"behavior modification," a small step that avoids exclusionary classroom discipline, which some researchers and scholars argue is the first stop in the "school to prison pipeline" (e.g., Skiba, Simmons, Staudinger, Rausch, Dow, & Feggins, 2003; Fowler, 2008).

Developing a Teacher Identity

Like Mauro and Bruce, June's initial teacher identity developed in relation to her students, their responses to her teaching, and the various enabling and constraining conditions of the school setting where she taught. In contrast to the two previous accounts, however, June's interactions with students—although sometimes challenging—were fairly stable across the duration of the study and were positively influenced by certain setting elements, such as an extremely supportive and collaborative department (a contextual condition that is discussed in more detail in the next section). In relation to these factors, June's developed a multi-faceted teacher identity—becoming a caring teacher, a calm authority figure, a student advocate, and a leader within her department despite her novice status.

Becoming a caring teacher. June viewed herself as a caring teacher who held her students to high standards and did not see their "disability" as a hindrance to their academic success. Instead, she believed the students merely needed her to create different pathways for them to demonstrate their talent. This view developed over the first few months of the school year. While at the beginning of the school year June discussed her students' communication and information processing issues as drawbacks, by the final interview in January she was convinced that her students were just as capable as "general

education" students. She viewed her students' label as "special needs bullshit," passionately arguing, "I am pushing them just as hard as I would push kids that weren't special needs and they are doing it just as well, it's just structuring it in a different way."

June demonstrated her caring for the students in both explicit and implicit ways. She often directly stated how much she valued her students to soften a redirection if they were not cooperating or participating fully. As an illustration of this tendency, when a student resisted June's attempts to refocus her during a lesson, she knelt down to be face-to-face with the student and said quietly, "I'm only pushing you like this because I care." In a different class, June asked a male student who had been distracted during the lesson to stay afterward and talk with her. She told him, "I care about you, but I also care about your grades." June's intention in these types of direct communication, she reported, was to convey not only caring and concern for the students as people, but also for their success in life. She reflected,

> I hope I'm really seen as a teacher who cares. You know, I care about the content, I love my subject area, so I hope that comes off to my students, and also that I really care about them being successful…I'll bend over backwards to make sure you are successful, but also that you need to put in the effort too, but in the end, that's making you more of a successful person. So I've said that in numerous ways, and I think a lot of the students have gotten it.

June also communicated her caring indirectly by recognizing that the students were human beings with needs, She kept snacks, like granola bars and graham crackers, in the classroom in case they were hungry, and also used a Brita water filter to keep clean

water for them. June demonstrated her understanding of students' physical discomfort as well, as exemplified by the following incident. Washington had no air conditioning and on one unseasonably warm day a student entered class a few minutes after the bell had rung. Instead of taking her seat, the student bypassed her desk and crossed to the window fan, holding her shirt away from her body in an attempt to dry the sweat that coated her front and back. Rather than admonishing the student to sit and begin work immediately, June recognized her need to cool down before she could be productive, stating, "So after you cool off, go ahead and get started."

Students responded favorably to June's words and actions, which consistently demonstrated her caring for them. As mentioned above, over the semester students began spending more and more time in June's room, choosing to spend their lunch periods with her and their biology classmates rather than in the cafeteria with their peers. Students also demonstrated their reciprocal trust of June by coming to her for comfort and confiding information about their lives. As an example, a student came running into June's room in the middle of a lesson, tears running down her face. When June noticed, she walked over to meet the crying student. Hiccupping, the student warbled that her class had gone on a field trip and she had been accidentally left behind, and asked if she could stay with June for the period. June enveloped the student in a comforting hug, assured her she could stay, and got her settled at a table before returning to work with her class. In another instance, a female student demonstrated the trust she placed in June with a confession about a personal tragedy she had suffered over the holiday break. June had previously considered her to be one of her most challenging students. The girl was

frequently absent, and when present in school she often refused to participate in activities. Given their previous interactions, June was shocked that the girl had chosen to confide in her, but was also elated to have gained the girl's trust. Believing this event to be a turning point in their relationship, June reflected,

> I thought she was telling this to everybody [about her personal tragedy], which she wasn't—which kind of showed me that she knew I cared about her. Since then, it's been better…so we were like, at a basketball game, and normally there is no way she would have said hi to me. And she was like, 'Hi Ms. Lake!' From the bleachers! And I was like [in a very excited voice], 'HI [student's name]!!'"

Becoming a calm classroom authority figure. Over the first several months of school, June also became more confident in her ability to serve as a classroom leader who was an authority, but was not necessarily "authoritarian." She sought to provide calm, orderly leadership in the classroom without "controlling" her students. As she explained, "I'm never going to be this aggressive authoritative figure, but…I still want to be an *authority*." June was committed to remaining calm and level-headed in the classroom at all times, having experienced the unproductive results that occurred during her residency year when she become angry with students in classroom situations. In her first interview, she articulated, "I don't…let my blood boil, which is something I did in the beginning of last year…I've made a promise to myself, that nothing is personal against me." Part of her learning how to be a classroom authority—but not being authoritarian—included resolving the tensions she felt between cultivating an open environment and desire to be respected as the class leader. June worried that if students perceived her as being "too

chill"—that is, too relaxed—she would not be able to command their attention should a serious situation occurred in her classroom at some point in the future. She wondered,

> [Will there] come a time when something happens in my room and…now that I've shown I'm not this aggressive person you need to listen to… that I'm not going to like, handle it properly? …or they won't take me seriously?

During the few months that followed, however, June observed that students did respond well to her calm persona, in combination with her other traits. Over the next few months, her worries that she was only "gliding along luckily" began to dissipate. In our final interview in January, June discussed her growing confidence that her students respected her as the class leader. As evidence, she shared the responses of her last period, B day class—a group of five boys who, as previously mentioned, had a reputation in other classroom for being extremely challenging. Noting their continued cooperation with her, she reflected, "I'm seeing that those boys do take me seriously, they stop cursing when I ask them to stop cursing, that they apologize for what they are doing, and they are like, 'only for you.'"

Advocating for students. June saw her work as a special needs biology teacher as grounded in social justice. Combined with this perspective, her small classes, trusting relationships with students, and supportive department contributed to an environment where June felt safe to become an advocate for students. This advocacy occurred in both subtle and direct ways. By creating options for her special needs students to succeed, she indirectly advocated for their academic achievement and began building their academic confidence. She advocated for her students in more direct ways as well, as the case of

Tyrone illustrates. One of June's most challenging students from the beginning of the year, Tyrone's frequent absences and unpredictable behavior complicated her efforts to build a relationship with him and figure out the types of negotiation strategies to which he would respond so as to coax him to participate when he did come to class. During a lab investigating the concepts of cohesion and adhesion, June was thrilled to see Tyrone highly engaged and working with a partner to test the amount of water droplets that fit on the head of a penny. However, the class was interrupted by the head of "In-School Suspension" (ISS), a holding facility for students who had committed an infraction considered to merit removal from class, but not egregious enough to require an out-of-school suspension. The ISS head told June he needed to take Tyrone with him, and asked that he bring his classwork for the day. While another teacher might have dismissed the student without questioning the school's authority, June reacted differently. She told the authority the class was in the middle of an experiment, which Tyrone could not take with him, and added: "He doesn't come to class that often…and he is doing so well today." She also offered to walk him down to ISS herself once the lesson was concluded. After initially balking, the authority was eventually swayed by her argument and agreed for her to bring Tyrone down to ISS when the lesson was over.

June's support of Bobby's career aspirations provides further evidence of her advocacy for students and also demonstrates her caring about them and belief in their capabilities. June described attending an IEP meeting for Bobby, who had shared with her and his case manager his fervent desire to become a veterinarian. June told me that during the meeting, at which Bobby was present, the case manager implied he would not

be capable of attending veterinary school and instead should set his sights on a related, but less rigorous path, such as a veterinary technician. She quoted the case manager as saying to the adults in attendance, "I explained [to Bobby] that there's going to be a lot of science, and so we were thinking about what kind of other *technical* areas he could go into." June was furious that the case manager and other adults were apparently in agreement that Bobby's dream was futile given his *disability.* She seethed, "[Bobby] looked so depressed! I was so angry! …Are you really going to kill the one kid who wants to study science?… Shut the hell up!" June took Bobby aside after the meeting and assured him that he could, indeed, study biology in college and become a veterinarian if he set his mind to it and worked hard. She told him, "You can definitely be a biology major. Don't let anyone tell you (that) you can't do it. It's going to be hard, but you can do it." To assist Bobby in building a noteworthy resume for college applications, she helped him identify and apply for summer internships, wrote letters of recommendation for him, and connected him with a teacher in the school who worked for a summer science program at a local museum.

Emerging as a teacher leader. Alongside these developments, June became a leader within her department, a role that subsumed her advocacy for students. As an illustration of June's emerging leadership, teachers in the science department met once a week in June's classroom for collaboration as a "professional learning community" (PLC). Although the department chair facilitated these meetings, June volunteered her room as the regular meeting space. As June discussed her inquiry-based lessons and ideas in the PLC meetings, teachers began to come to her for advice regarding ways to

infuse investigations and problem posing into their own lessons. June credited her year with the NUTR as a contributing factor in her expertise, commenting,

> [the NUTR experience] obviously shapes my instruction, and just puts me ahead of other teachers. I mean, I'm not saying I'm better, but it gives me advantages over a lot of first AND second year teachers I have been working with. And it's really evident, because I've already had a lot of teachers come to me for stuff that I'm doing, or help with their lesson… But I've had veteran teachers come, again, not like promoting myself, but just because of what I learned in that year, where they had just been introduced to it in their staff development days.

June quickly became considered an expert within her department, the "go-to" person for inquiry-based and experiential lessons. After observing June's facility with both planning and enacting inquiry-based lessons lessons, the science department chair asked her to lead a professional development session about inquiry-based teaching methods for other teachers in the department.

Bolstered by these developments, which were enhanced by the success she experienced in her teaching, June began to take the initiative on other efforts. Responding to her students' challenges with scientific vocabulary, she proposed to lead a school-wide project to identify common roots, affixes, and suffixes among the core classes and collaborate with the other teachers to create linguistic supports for them across the tenth grade level. She also felt sufficiently secure to assume the dissident voice within her department at times. For instance, June took issue with the previously mentioned department-wide Criterion Reference Test (CRT), arguing that the assessment

was inappropriate for her students and should have been collaboratively developed with input from all science teachers. Although she unhappily administered the first assessment to her students, as noted in the preceding sections, June was able to convince the department chair to allow her to modify the assessment format to accommodate their needs, as necessary. She also convinced her chair to involve all science teachers in the construction of future assessments.

Context Matters

An interesting and surprising development in June's case concerns her school context and the ways in which particular factors in that setting interacted to affect her teaching practices. As previously noted, Washington was a school with a notorious reputation for having challenging students, a chaotic environment, and outbreaks of violence among students. The school was in its final year of program improvement, and rumors that Washington would be shuttered the following year set teachers and staff alike on edge. Beyond this daunting school environment, June also had accepted a position as a special education biology teacher, even though she had with very little preparation for teaching special needs students. Faced with such challenging circumstances, the NUTR faculty's worries about June's decision to take a position at Washington seem warranted. Yet, despite these seemingly difficult conditions, my analysis shows that two supportive contextual factors—multiple layers of instructional support and small classes—interacted with June's own personal qualities to produce an enabling environment for enacting equitable pedagogical practices.

Multiple Layers of Support

Although the actual school-based mentor assigned to June was "non-existent," other forms of instructional support—from her department chair, colleagues in the science department, and an induction coach provided by the NUTR—more than made up for the lack of formal peer mentorship. June felt especially supported by her department chair, who she described as "amazing," adding effusively, "I LOVE her!" Early in the school year, June's department chair informally stepped into the role of mentor, frequently observing snippets of her lessons while I was present. She also helped June refine lessons and assessments, and boosted her confidence by affirming her teaching methods. Describing the science department chair's influence on her, June noted,

> [My department chair] is great, and she actually looks at our lesson plans, and gives positive critiques and like, helpful things…she asks for my tests every time, so she'll look at my tests and give me suggestions as to things she thinks would work, and she's been nothing but positive and giving me really good feedback, and just little things that she says I can tweak.

June's department chair also cultivated a collegial culture among the science teachers, facilitating weekly professional learning community (PLC) meetings and encouraging collaboration on lesson-planning and assessment creation. As a result, June reported, "I've really built a bond with some of the teachers there, especially the chemistry teacher, who is a new teacher too." She found the chemistry teacher to be another important source of support. They brainstormed ideas for lessons together, gave each other feedback on assessments as well as day-to-day tasks. June shared, "We've

emailed our tests back and forth, and given comments on our tests, and… whenever she needs something or I need something she's there or I'm there to do it."

The induction coach assigned by the NUTR encompassed a third source of support for June. She reported that the induction coach observed and provided feedback often in the beginning of the school year, although these visits became more infrequent as the winter holidays drew near. Despite the reduction of observations over time, June perceived the induction coach's mentoring to have been especially helpful in building her knowledge of the kind of accommodations and differentiation required by her special needs students. For instance, June reported feeling deflated after the majority of her students performed poorly on the first assessment of the year. The induction coach met to reviewed the assessment, helping her think through ways to more closely connect its content with the students' in-class activities. Equally important, she assisted in redesigning the test questions to allow for multiple types of answers. Describing the changes made, June explained,

> The first test had a portion where they had to look at an image and tell me if it was subjective or objective. And we changed it to…an actual object, like we had done in class before. I put the object at the front of the room, and they had to make the same observations about the object…they did ten times better. The other thing was putting the scientific method in order…I mixed up the steps [of the scientific method] and put them in another column, so they could either match them or—that was good because they had an alternate way of responding.

Small Classes

Beyond the support June received from her department chair, colleagues, and induction coach, the small number of students June taught worked to her advantage. Although June labeled her tiny classes somewhat problematic because such small numbers hindered student-to-student discourse, having only a total of twenty students allowed her to get to know them well and to develop the type of relationships that supported learner-centered, inquiry-based instruction. She was also able to make contact with most of the students' parents on a regular basis, speaking with them on the phone, email, and via text.

That each class included only two to five students also gave June frequent opportunities to make personal connections with them. For instance, June referred to a specific lesson during the first few weeks of the year that helped her forge a bond with one particularly challenging student. Because only two students attended class that day, June let them listen to their Ipods while they worked. This created a relaxed atmosphere, and the two girls began asking June questions about herself. They connected around the knowledge that June's boyfriend was Dominican—as both students were. June reflected, "I think they got to know that I was a person, and I think …[the challenging student] found out that my boyfriend was Dominican, and that made me cooler…so since that it has been better with her."

Her small classes also enabled June to engage in students in the type of one-on-one negotiations another teacher with larger groups of might not have been able to do. During one of my observations, the students needed constant encouragement to complete

an assessment task. As soon as June handed out the tests and gave instructions, one student laid her head down on the table and muttered, “I don’t want to do this.” June replied, “I know, but you’ll do it anyway.” She crossed over to the student and crouched down to talk with her face-to-face. “You are too smart not to do this. Come on, the first one isn’t hard at all. What is it asking?” With a sigh, the student picked up her pencil and began to work. June began to circulate among the students, encouraging each to continue. When another student put down her pencil and took out her phone, June walked over and asked her if she was finished. When the student shook her head, June advised, “Why don’t you take a short break and then try again?” The student looked away. “I don’t want to.” June looked at her paper, encouraging, “Come on, you are almost done. Did you read this last one? What does it say?” When the student didn’t respond, June began to read the passage to her quietly. The student pointed at the answer. “OK,” June said, “Now write that down and you are done!” With only four students in the class, June was able to provide this type of individualized support to enable each learner to finish the assessment.

The conditions that supported June’s equitable teaching already existed in her environment. However, the way she responded and interacted with these circumstances fed into June’s overall construction of her practice. Thus, June both shaped her contextual conditions while being simultaneously shaped by them. As an illustration, June’s department chair provided a supportive environment, but June emphasized, “I’m also one to seek out support when I need it.” Put another way, the conditions for agentic actions might have been in place, but June seized the chance to act on those conditions. For

example, several weeks into the school year June still had not received copies of her students' Individual Education Plans (IEPs), forms which spelled out the type of disability each student had and the accommodations teachers needed to make to ensure their success. Although colleagues warned her not to "harass" the counseling office staff, she found the lack of information that might help her to better support the students instructionally unacceptable. After discussing the situation with her department chair, who agreed to provide support in the matter, June went down to the counseling office and requested the IEPs. While knowing she had the department chair' support contributed to June's confidence to dismiss her colleagues' warning and request the documents, she displayed considerable initiative by initiating the meeting with her department chair and then acting to retrieve the IEPs from the counseling office.

Discussion

June's case is an interesting example of how the ongoing interactions between teacher, students, context, and other setting elements can produce unexpected results. At face value, the initial conditions June faced seemed to present many challenges to her enactment of equitable teaching practices. Yet, a few enabling circumstances in the context (like the layers of instructional support available to June and small classes), June's own qualities and responses to adversity, and the relationships she was able to forge with students enabled her to construct teaching practice that "plugged in" several elements of equitable teaching she had learned from the NUTR. In this final section of the chapter, I use key rhizomatic concepts to make sense of the interactions of self, students, context, and other elements within June's teaching-assemblage. I also return to

the idea of constructing an equitable pedagogy through rhizomatic lines of flight, or breaks from the status quo reconstructed over time.

Interactions Within an Assemblage

As previously mentioned, June's school setting initially seemed as if it would present many difficulties to navigate, which might have created a stratified or rigid space that would hinder June's translation of the type of equitable pedagogy she had studied in the NUTR. Although she held a position as a biology teacher—her college major and the course she had taught during her residency year—June was also teaching special needs students exclusively for the first time. Not only had June not been prepared to teach special education students, but the students themselves presented a challenge because they had internalized the *disabled* label (Slater, 2012) and often resisted the more active learning she tried to enact. Moreover, June's new setting was quite different from the school in which she completed her preservice apprenticeship—a relatively small, arts-themed school with selective enrollment that contrasted sharply with Washington's large neighborhood campus, notorious throughout the city for its difficult students. Teaching a different version of her subject, challenged by the resistance of her students, and experiencing a challenging school setting, June might have struggled to survive, as many first year teachers do (Chubbock, et al., 2001; Feiman-Nemser, 1993; Veenman, 1984), returning to more traditional lecture-type methods to retain control of her classroom and mediate the demands of her new position (Allen, 2009; Cady, Meier, & Lubinski, 2006; Flores & Day, 2006).

Yet, June's case illustrates that the way elements in a context *come into composition* with each other to form an assemblage (Deleuze & Guattari, 1987) can produce unexpected emergences. In other words, the teacher, her students, and factors in the school setting can interact to create new circumstances, ones that are different (rather than additive), and not predictable from initial conditions (Davis & Sumara, 2006). June herself brought elements to her teaching setting that have been shown to facilitate success for new teachers, including a positive attitude and enthusiasm toward teaching (Hebert & Worthy, 2001), a reflective disposition (Bianchini & Cazavos, 2007), commitment and motivation (Luft & Roehrig, 2005), and a tendency to take initiative and be an advocate for herself and her students (Starkey, 2010). Despite the challenges presented by various factors in her school context, the personal qualities and tendencies June brought to the assemblage combined with the unexpected factors of instructional support and small classes (Achinstein, Ogawa, & Speiglman, 2005) to create productive conditions for enacting practices that were inquiry-based, differentiated for her students needs, relevant and meaningful to the learners, and built important scientific literacy skills. The ways June reacted to these environmental factors—seeking support from her department chair and colleagues, taking advantage of her small classes to get to know students, and motivating them through the use of incentives—and the ways her students responded in turn fed into the productive functioning of June's assemblage as a whole.

As discussed in Mauro's and Bruce's cases, the notion of *a teaching-assemblage* can provide insight into how different contextual elements function together to influence the ways that teachers make sense of and enact teaching practice. The construct of

assemblage does not just refer to the conflux of teacher, students, and various contextual elements, but also includes the ways they work in tandem and the processes by which they influence and co-produce practice. By "co-produce," I am not suggesting that these elements all have an equal and direct role in the construction of practice. Instead, I mean that multiple factors shape the production of teaching practice, not just the teacher herself. In June's case, the contextual factors combined with June's own personal system of beliefs, intentions, and desires to boost her confidence in pursuing the type of instruction she felt was appropriate for her students. Simultaneously, June was able to engage in productive negotiations with her students that, over time, contributed to their feelings of success in academic activities and an increased willingness on their part to engage in the instructional activities she planned for them.

Constructing a Pedagogy of Equity

The unpredictable ways that June forged connections with her students and other elements in her context resulted in a smooth space within which to construct equitable pedagogy. In previous chapters, I have suggested that a pedagogy that differs substantially from the status quo of transmission teaching is negotiated with students and context, and is constructed over time as lines of flight, or momentary breaks from the status quo. If repeatedly sought in practice, these lines of flight can result in larger, sustained changes (Deleuze & Guattari, 1987). Although multiple, sustained lines of flight are evident in June's teaching, in this section I concentrate on the reconstructed line of flight disrupting the category of "special needs student."

As is common with learners who have internalized the label of "problematic 'others' to be tolerated and managed" (Slater, 2012, p. 1), and who have realized that academic failure is expected of them (Allan, 2011), June's students often shut down when faced with tasks they felt they could not complete. The label of *special needs student* is a molar category—that is, a normative label assigning particular features to a group of people. Students with a "special needs" or "disabled" classification are viewed as inferior in the context of school because they do not fit neatly in the entrenched norm of "student" as an autonomous learner—a view that parallels the neoliberal idea of self-sufficient individualism (Goodley, 2007). However, June began to realize that her students were not *less than* because they required supports—they were merely *different*. If teaching were approached in ways that differed from the norm of instruction that expected the student to be an autonomous learner, and instead relied on collaboration—either with a peer or teacher—to provide appropriate support that met their needs, her students could be both different from the norm *and* high achieving.

Adopting a proleptic stance, June provided both academic scaffolding and emotional support for her students. That is, she believed her students could complete tasks, even if they might not yet have all the skills to do so (Vygotsky, 1978), and provided support to help them to perform beyond their current levels of capability. She presented multiple entry points into academic tasks and assessments through differentiating activities for various abilities and needs, providing multiple methods and modalities of content representation, and designing alternate ways for students to demonstrate their learning. By finding ways to respond to student needs, meeting them at

their ability levels, and helping them bridge to required skills and competencies, June and her students co-constructed lines of flight that disrupted the molar category of "special needs student," the label given to a learner who is unsuccessful at "regular" or "mainstream" academic tasks (Goodley, 2007). Over time, her students built confidence as they experienced success and demonstrated scientific proficiencies, as illustrated by their collective out-scoring of all other science classes on the department-wide quarterly Criterion Referenced Test.

Although this context is one characterized by special-needs and admittedly atypical relative to class sizes, June's experience with her students holds valuable insight for working with marginalized student populations who may resist more learner-centered experiences. June's interactions with her students support the notion that prolepsis (Vygotsky, 1978; van Lier 2004), in combination with appropriate supports, can be a fruitful perspective for teachers. Over time, as teachers express belief in their students, provide high levels of both support and challenge (Walqui & van Lier, 2010) with students experiencing success, lines of flight are constructed and reconstructed, resulting in increasing levels of student participation and learning in classroom activities.

Chapter Seven: A Cross-case Perspective

In this study, I set out to investigate the question: "Given their common experiences of preservice preparation in a hybrid urban teacher education program, how do three first-year teachers negotiate their pre-professional pedagogical learning within their new school environments as they construct their teaching practice?" There are important reasons to investigate this question. Although research shows that transmission views of teaching and authoritarian teacher-student interactions prevail in classrooms, especially in urban schools (e.g., Haberman, 2010; Singer, et al, 2011), few studies have examined *how* teachers make sense of their pre-professional preparation within the context of their first-year teaching. Moreover, in the last decade, educational policy and research have both experienced a resurgence of positivist, linear thinking (St. Pierre, 2006). From this perspective, teaching is presented as a causal transaction and teachers are seen as autonomous actors (Opfer & Pedder, 2011). Illuminating the complex nature of beginning teaching not only addresses a gap in the teacher education research literature, but may also inform and potentially interrupt the simplistic notions of teaching that currently dominate educational policy and research (Cochran-Smith, 2013).

To address my research question, the three previous chapters presented accounts of how the study participant constructed their practices as first-year teachers. Mauro taught earth science to eleventh- and twelfth-grade students and environmental science to ninth-grade students, Bruce taught physics to ninth-grade students, and June taught biology to tenth-grade students with special needs. I found that despite engaging in different micro-level interactions within their respective classrooms and schools, the case

study teachers built their teaching practices through three similar, recursive, connected, and contextually situated processes: 1) translating or molding the pedagogical strategies learned at the NUTR to fit their first-year school settings and tailoring them to the experiences of the specific students they taught; 2) negotiating with students for their participation in the learning activities they created for them; and 3) constructing and enacting teacher-selves.

In this chapter I discuss these three processes from a rhizomatic perspective. Before turning to that discussion, however, I review important rhizomatic concepts I used to theorize the work of teachers as constituted by a conflux of human, material, and discursive elements. By "element" I mean a component or part of an "assemblage," which within rhizomatics is defined as a collectivity of some kind—a grouping that can include any number of elements, both human and nonhuman, tangible and intangible, that together serve a particular function (e.g., being a teacher, being a student), in a particular context (e.g., teaching environmental science to ninth grade students at Lincoln High School), at a particular time (e.g., an era of accountability). For example, a classroom could be an assemblage composed of desks, teacher, students, books, classroom space, and discourses of what it means to be a "teacher" or what it means to be a "student." It is worthy of noting, however, that a classroom assemblage is not limited to the components mentioned above. That is, generating an exhaustive list of elements that constitute an assemblage is an impossible task.

Beyond being an aggregate of people, objects and ideas, the notion of assemblage also encompasses processes, or the ways in which the comprising elements work as a unit.

A teaching assemblage, then, is not merely a network including a teacher, students, context, and discourse, but also involves how those elements come together to produce teaching and learning (or other processes). Because it is comprised of *multiple elements*—that is, it has many different components—an assemblage is considered a *multiplicity* in rhizomatics thinking. Thus, assemblage and multiplicity are synonymous terms. In the discussion that follows, I use *multiplicity* at times as a noun to mean both the product and process of a working collectivity, and at other times I use it as an adjective to describe an assemblage. (These and other important rhizomatic concepts used in this study are defined in the glossary included in Appendix F.)

In looking across the cases and processes implicated therein, three main themes stand out—the existence of a non-linear relationship between what the participants learned about teaching as residents in the NUTR and the construction of their first year practice, the relational nature of teaching and teacher development, and the challenges of constructing a pedagogy of equity as a first-year teacher. Below, I elaborate on each of these themes, using rhizomatic thinking in an attempt to move away from a traditional conception of teaching toward a more complex perspective that attends to the multiple forces that come together at different moments to shape classroom life.

The Non-Linear Relationship that Exists Between Preservice Teacher Learning and First-Year Practice

The three cases presented in this study lend support to the idea that "transferring," or perhaps more aptly put, "translating," what teacher candidates learn about pedagogy from their pre-professional programs into classroom practice is a non-linear and complex

activity (Borko & Putnam, 1997; Cochran-Smith, 2003; Cochran-Smith, 2013). Although a body of research exists demonstrating the often minimal impact of teacher education on beginning teachers' actual instruction (e.g., Cochran-Smith & Zeichner, 2005; Grossman, 2008; Zeichner & Tabachnik, 1981; Wideen, Mayer-Smith, & Moon, 1998), my data suggest that attending to the multiple meaning-making processes in which new teachers engage as they develop their early teaching practices can help the research community develop a more textured understanding of the complex relationship between preservice teacher learning and first-year teaching.

The data presented in the previous chapters suggest that Mauro, Bruce, and June did not assimilate the pedagogical vision of the NUTR program, whole, and "transfer" it in a pure form to the school settings where they taught during their first year as teachers. While their teaching was clearly informed by what they had learned about pedagogy as residents in the NUTR program, their preservice learning underwent several transformations. As residents, Mauro, Bruce, and June made sense of the pedagogical ideas promoted by the NUTR through the filter of their own beliefs, experiences, and histories (Borko & Putnam, 1997) while simultaneously constructing meaning in a social setting (Vygotsky, 1978) with fellow residents, school-based mentors, and program faculty. This learning then traveled with the teachers into their initial year of teaching, during which they engaged in additional meaning-making processes to construct their practice. As mentioned in the introduction to this chapter, these processes involved the study participants in working out their pedagogy in the context of a particular school and with particular students, negotiating with students for cooperation and participation in

instructional activities they created for them, and developing notions of teacher-self. However, a constellation of factors—including the understanding of teaching they each brought from the NUTR and the types of relationships they built with students in conjunction with elements of their school settings (e.g., instructional supports available, class sizes, testing policies)—shaped these processes, ultimately affecting the practices each teacher produced to different degrees and in different ways.

For example, Mauro began his first year of teaching convinced of the pedagogical importance of problem posing, differentiated learning, and building student relationships. At the same time, he still needed to work out what teaching for inquiry meant on a day-to-day basis. Once in the classroom, his ability to enact practices consistent with his beliefs depended largely on the responses of the students in his classes. Because he was able to successfully negotiate the participation of the eleventh- and twelve-grade students to whom he taught earth science, the practices he co-constructed with them, including open-ended questioning and experiential learning, were characterized by democratic relationships. Through those experiences, he began to see himself as a caring teacher with high expectations. However, Mauro was unable to consistently gain the cooperation of his freshmen for open-ended activities during instruction in environmental science. In response to the difficulties he experienced with this second group of students, Mauro modified his teaching to include more direct instruction. Additionally, the conflict he experienced with the students in an ongoing manner contributed to the enactment of a more authoritarian teacher-self with his ninth graders.

Bruce, more so than Mauro, struggled with the constructivist pedagogy the NUTR promoted because it conflicted deeply with traditional beliefs about science teaching he brought to his pre-service preparation. By the end of his residency year, the internal tension he initially experienced over teaching methods had subsided, but it resurfaced shortly after he began his first year as a teacher. Although his students were generally cooperative and willing to participate in most of the lessons I observed, contextual factors—such as a drastic change in school leadership, a lack of mentoring support, and a dearth of resources—made Bruce insecure about using the innovative pedagogies to which he had been exposed through the NUTR. These external elements interacted with his unresolved internal pedagogical conflicts to produce contradictory teacher-selves. At times, Bruce was a caring, "zany" teacher who sought to provide creative learning opportunities for his students. Outside the classroom, however, Bruce felt compelled to follow his principal's authoritarian mandates and "play it safe" in order to keep his job. These processes produced erratic teaching patterns that fluctuated between project-based instruction and traditional lecture.

As a third illustration, June began her first year of teaching with a firm commitment to infusing her instruction with questions and investigations. In her own words, she "bought into" the NUTR pedagogical philosophy and methods "from her core." By continually modifying her teaching to meet individual students' needs and successfully building relationships with them, she was able to enact practices that were inquiry-based, supported scientific literacy, and provided multiple entry points for class assignments and assessments to enable all her students to experience success. These

classroom practices were reinforced by contextual factors, such as the multiple layers of mentoring support June received from her department chair, colleagues, and NUTR induction coach, in addition to the small classes assigned to her. The interactions between and among these multiple factors helped shape her initial teacher identity as a caring, calm authority figure, a student advocate, and an emerging instructional leader.

From a socio-cultural standpoint (Vygotsky, 1978), the ongoing meaning-making processes in which each of the three teachers engaged with themselves, their students, and their contexts follow an interactional view of learning. That is, in keeping with Vygotsky's theory of learning, teachers learn first on a social plane through interactions with others and then internalize this learning, thereby transforming their previous understandings. Upon moving into the classroom, the teacher continues to engage in sociocultural meaning-making processes in social settings with her students, continuing to renegotiate, revise, and transform learning about pedagogy. While such a Vygotskyan perspective frames the ongoing, interactive nature of teacher learning in a fruitful manner, rhizomatics can enhance our understanding of learning to teach by illuminating what those interactive processes look like in action. Specifically, the notion of "assemblage" can further inform the contextualized view of translating preservice teacher learning into classroom teaching, as I discuss next.

As previously noted, the rhizomatic term "assemblage" refers to a multiplicity or collective of different elements (which might include people, things, physical spaces, and/or ideas) coming into composition to produce something or serve some function—that is, engaging in some kind of activity (Delanda, 2004; Deleuze & Guattari, 1987;

Livesey, 2005). For instance, a teaching assemblage is an amalgam of teacher-students-context-discourse that might fit together to produce teaching and learning (although it could also produce chaos or reproduce social inequalities as well or instead). In this way, the idea of assemblage does not just refer to a static entity or just a conflux of particular components, such as the above-referenced teaching assemblage. The idea also encompasses the processes by which such a constellation collectively generates some kind of production (like teaching and/or learning). Stated differently, the example of the teaching assemblage would not only include the teacher, students, contextual conditions, and discourses, but it also would address the ways teaching is constructed and learning happens.

According to this view, each of us is already a multiplicity encompassing our physical beings as well as our intangible features, such as past experiences and desires (Deleuze and Guattari, 1987). We are comprised of networks of organs working together to produce bodily functions. We are a patchwork of interests, emotions, and aspirations. Just so, the teacher enters the profession as an assemblage composed of prior experiences, ideas, and intentions, among other things. When the teacher "plugs" herself into an assemblage comprised of classroom space, students, content, and schooling discourses (Defreitas, 2012), the ways in which she comes into composition or fits together with that assemblage enables different productions. That is, the way a particular teacher "system" works in conjunction with her students and the affordances of her context affects that teacher's meaning making processes and the practices enacted within them.

Two points can be made about the forming of teacher-assemblages in the first year of teaching. First, upon inserting herself into new teaching-assemblages, or the multiplicities present in the teacher's new context, her preservice learning is but one component in her own assemblage, which in turn is only one piece of the new teaching-assemblage that includes her students and her specific context. Although the teacher develops a particular understanding of learning to teach in her pre-professional preparation, those ideas continues to morph with exposure to the many new situational elements encountered in the first year of teaching. Most notably, these elements include the students they teach and the varied experiences those students bring to the classroom, but they also can encompass other actors in the setting, contextual conditions, and the teacher's own reactions to unfolding events. Thus, preservice learning is only one of many possible influencing factors within nested multiplicities.

Second, because of its multiple metamorphoses in the processes noted above, the teacher's initial learning may be enacted in a substantially different form. Preservice learning—the pedagogy of the NUTR in this study—is not monolithic. That is, a pedagogical vision is itself a multiplicity, consisting of many moving parts. As the products of multiple, ongoing negotiations with students, self, and contexts, the practices each study participant enacted were not transferred whole from the NUTR program, nor were they the pure "application" of knowledge (Korthgen & Kessels, 1999) study participants had learned from the NUTR. Instead, as I indicated above, "translating," a term Walqui and van Lier (2010) used to describe the contextualization of abstract pedagogical principles, may be more fruitful for discussing the phenomenon of enacting

practices based on preservice learning. As I use it here, *translating* means that some elements and general principles of the NUTR vision of teaching were visible in the practices of the three new teachers, but each made sense of it within the specific setting and situation in which the teachers found themselves. For instance, Bruce's teaching was often characterized by teacher-fronted, math-based lectures, but he also interspersed this traditional method with physical demonstrations of phenomena, a strategy that aligned with the NUTR vision of teaching. June considered inquiry the foundation of her teaching, but continued to build her practices based on the specific needs of her students—recognizing, for example, that they needed to be supported in acquiring discipline-specific language in science. Thus, attending to scientific literacy became a simultaneous focus of June's lessons, alongside content.

The process of translating preservice learning into practice might be further developed. From my analysis of the three cases, I identified three different types of translations. The first was "plugging in," a term used by Deleuze and Guattari (1987, p. 4) to indicate the connection of one multiplicity to another to take on meaning. Colebrook (2002) uses the example of a bicycle to illustrate the concept of "plugging in." When taken alone, the concept "bicycle" lacks meaning. Yet when connected to a rider, the bicycle becomes a form of transportation. Alternately, if the bicycle is part of a sculpture in a museum exhibit, it might be considered a work of art. Here, I use the notion of "plugging in" teaching practice to indicate a process of contextualization. Teachers "plugged in" particular ideas they believed would work within their particular settings at a given time. As an example, Mauro chose to focus on problem-posing aspects of

inquiry-based teaching rather than student-led, hands-on experimentation of phenomena. With classes meeting only every other day, he felt the time needed to set up each experiment, assign materials, and provide directions would dramatically reduce teaching time. In so doing, he molded the NUTR vision of inquiry to his particular needs.

As a second translation strategy, the teachers tailored their teaching based on the particular needs of their students. June illustrated this strategy when she created practicum-based assessments to help her students build confidence in their test-taking abilities. A teacher might also use this strategy in response to students' actions at a particular moment in the lesson. For instance, when a student refused to answer a writing prompt that was part of an assessment, June responded by asking him to give the answer verbally and writing it down for him.

Third, study participants substantially modified a pedagogical strategy from their preservice program, based on their own personal meaning-making of the principles undergirding that strategy. Bruce's understanding of inquiry-based learning and his subsequent planning of a lab activity that he considered to be "100% hard inquiry" is illustrative of this type of translation. Although NUTR faculty had discussed a range of supports for inquiry-based learning, such as graphic organizers, Bruce indicated that his idea of inquiry meant a prolonged, open-ended, unstructured activity. Thus, his practice of inquiry-based learning was translated according to his own understanding of the concept.

What, then, is the relationship between learning to teach in a preservice program and first-year teaching practice? The findings of this study suggest that no straight line

exists between these two experiences. Instead, I contend that the relationship is non-linear and complex. As detailed in the three case studies, the contextual, meaning-making processes teachers engage in during their initial year in the profession involve multiple translations of ideas about teaching from their preservice programs. These translations might take different forms based on the way the elements in any teaching-assemblage come together and interact at any given moment. If no linear relationship exists between preservice teacher learning and inservice teacher practice, it follows that the link between preservice teacher education and the "outcomes" of program graduates' students is nebulous at best. This insight challenges the current policy push to evaluate university-based teacher education based on the value program graduates add to their students, as determined by scores on standardized tests. Simply put, such policies are flawed because they assume the existence of a linear relationship on decidedly non-linear phenomena, an issue I take up in the conclusion of this study.

A Relational View of Teaching and Teacher Development

Another consideration in the complexity of enacting practices informed by preservice learning is the role of relationships, or the process of "coming into composition" or "fitting together," in rhizomatic terms. As Deleuze and Guattari (1987) note, "Any point of a rhizome can be connected to anything other, and must be" (p. 7). In other words, the work of the rhizome occurs by means of connection—as does any kind of social activity, including the workings of a classroom (Davis & Sumara, 2006). Deleuze and Guattari further contend that a multiplicity or assemblage "changes in nature as it expands its connections." That is, as connections are made when elements interact

with one another in a particular space, that encounter and the reciprocal affects of it change the productions of the assemblage. Taken up in the context of the school and classroom, this theoretical notion suggests that the objects, ideas, people, and spaces with which the teacher connects, such as her students, the school culture, other teachers or school leaders, and available resources, irrevocably shape her teaching practice (the production).

As such, the work of the teacher is fundamentally relational. By *relational*, I mean that her construction of practice is tied to multiple human and contextual elements present in her environment. My treatment of this idea goes beyond notions characterizing teaching as relational only in the human sense (e.g., Edwards & D'Arcy, 2004; Noddings 2012). While connections between teachers and their students, as well as other actors in their context, such as instructional leaders or colleagues, are certainly an important influence on the construction of teaching practice, contextual non-human elements also have a profound impact (Barad, 2007). These non-human or material elements include physical objects or space. For example, the fact that Bruce's classroom was not set up as a physics lab and he lacked appropriate laboratory equipment and textbooks served as a constraint on his teaching. Non-human elements might also encompass discursive factors, such as the labeling of Mauro's classes as "lower-track" or June's students' as "special needs."

Teaching is also *inter-relational.* That is, the relations between the pieces of a teaching assemblage are mutually interactive, with multidirectional (although not necessarily equal) impact. Thus, the work of the teacher is *co-constituted*. By this I mean

that teaching simultaneously shapes and is shaped by multiple influences, which vary by the nature of the teaching-assemblage and can be viewed as jointly produced by those influences (including the teacher and her preservice learning). From a researcher's perspective, I cannot say that the assemblage elements noted in this study are the *only* forces influencing the practices of the three teachers discussed here. Assemblages are not easily defined (or perhaps are even indefinite), as they can include many intangible elements (such as beliefs and past experiences) and are always growing by their very nature. As Deleuze and Guattari (1987) note, "The tree imposes the verb 'to be,' but the fabric of the rhizome is the conjunction and…and…and…" (p. 24-25). Said differently, because the rhizome is always evolving and operates by heterogeneous connections, some of which are not readily visible, naming all of its pieces would be impossible. However, two important influences were readily apparent in this study—conditions of the larger school context and student/teacher interactions. As I discuss below, the practices of the three study participants were shaped by these two major influences, although to different degrees, and with different "outcomes." Importantly, these constructions should not be taken as "final," as the processes are continually ongoing and evolving.

Factors in the larger school context. In each of the three cases, contextual factors in the setting and the ways in which each teacher interacted with them helped to shape their teaching practices, a finding corroborated by numerous other studies of first year teachers (e.g., Allebone, 2006; Bianchini & Cazavos, 2007; Chubbock, et al., 2001; Fry, 2007; Scherff, 2008). For instance, Bruce began the school year facing school-level factors known to hinder new teachers' enactment of instructional practices—such as a

lack of resources (Castro, Kelly, & Shih, 2010; Starkey, 2010; Tait, 2008), a mandated curriculum (Brashier & Norris, 2008; Ferguson-Patrick, 2011), a dysfunctional school organization (Scherff, 2008) and a lack of consistent and appropriate mentorship (Hargreaves & Jacka, 1995; Hebert & Worthy, 2001; Stanulis, Fallona, & Pearson, 2002). In addition to these constraining circumstances, a change in building level leadership occurred three months into the school year. The new principal was focused on discipline, valued traditional views of teaching, and was considering eliminating Bruce's position for the next year. In response to these conditions, Bruce became insecure about his teaching while continuing to wage an internal struggle between more traditional forms of teaching and the type of equitable pedagogy he had learned in his preservice program. The way all of these circumstances worked together—that is, their inter-relational effect—led to erratic practices that alternated between more directive, teacher-centered instruction and collaborative problem-solving or inquiry-driven projects.

Mauro and June were also influenced by elements in their settings, although somewhat less so than Bruce. Mauro felt pressure to cover the environmental science curriculum he taught his ninth grade students because they were required to take a standardized test on this subject at the end of the school year—another contextual circumstance that tends to challenge new teachers (Bergeron, 2008; Saka, Southerland, & Brooks, 2009). In contrast, because earth science was not tested, Mauro was freer to take a flexible approach to teaching that subject to his eleventh- and twelfth-grade students. Feeling less anxious to "cover" the content of the curriculum in a set time, in combination with his earth science students' inclination to cooperate with his teaching, allowed Mauro

to pursue side conversations with the students, which helped them make spontaneous connections between the content they were studying and their own personal experiences and prior knowledge. In turn, these "side conversations" facilitated Mauro's ability to build relationships with the students, which helped to gain their "buy-in" for more active learning activities.

Connections with students. Teaching is a social activity, not a set of isolated actions by teachers. As a social activity, teaching is co-constructed by the teacher and her students during instructional events. This applies whether teaching takes the conventional transmission format based on behaviorist theory (Skinner, 1976) or the more current student-centered approach informed by social constructivist or socio-cultural thinking (Vygotsky, 1978). When using transmission teaching, for example, the teacher depends on students' willingness to be silent while she presents academic content, listen attentively to her lectures (or at least appear to be doing so), take notes on the content presented, and answer questions when asked. In this type of teaching, students assume a passive role of receiving the content of the curriculum delivered to them by their teacher. Although teacher-led instruction requires the teacher to negotiate with students for their cooperation in lessons, the passive nature of the students' role clouds over the negotiation process, which becomes visible when a noticeable breach of the participation rules occurs (e.g., two or more students carry on a conversation while the teacher is lecturing, one or more students begin to walk around the classroom while the lesson is going on).

By contrast, teaching practices that build on a socio-cultural perspective on learning (Vygotsky, 1978)—like the types of equity-minded pedagogies I detailed in Chapter 2—are predicated on students' cooperation with, but more importantly, active participation in, the learning task at hand. For this type of teaching to succeed, students must assume a central role in their own learning, one that moves them beyond merely listening to the teacher to actively engaging in authentic learning tasks to make sense of, or give meaning to, the new ideas to which they are exposed. In shifting her students from a relatively passive role in learning to a more active one, the teacher who engages students in the construction of knowledge experiences more pressure to negotiate learners' cooperation in planned classroom activities. The intricate negotiations each of the three study participants engaged in with their students—detailed in the previous three chapters—attest not only to the high level of student participation that learner-centered teaching demands, but also suggests the critical role teachers' relationships with students play in securing their participation in learning activities over time.

Although Mauro and June negotiated more intensively with students to gain their participation than Bruce did, in all three cases building relationships with students was a critical factor in getting them to participate in lessons and in shaping the teachers' practices. Such negotiations might be particularly relevant to teaching students from groups that historically have experienced marginalization within schools, such as many urban students. Research suggests this student population tends to distrust schools and often adopt a stance of resistance to learning in an institution they find oppressive (Kohl, 1995; Ogbu, 1986; Ogbu & Simmons, 2008; Villegas & Lucas, 2002).

Mauro's case provides a particularly sharp example of how relationships with students can affect a teacher's practice. Although he initially applied the same strategies for building relationships with students in both classes, his upper-classmen bought into his efforts toward transparency and responded positively to his tactic of "side-conversations" or tangential discussions in which students made personal connections to the topic at hand. His ninth graders, however, did not respond in the same way. To gain their cooperation and maintain order, Mauro felt forced to use teaching methods and classroom management techniques he disliked, which in turn caused him internal tension. Thus, despite some surface similarities in context and the use of the same relationship building techniques with both classes, the particular elements of Mauro's classes and how they came together and interacted resulted in different practices. These differences speak to the critical role that students themselves play in the construction of equity-based, learner-center practices.

June's account not only supports the importance of building relationships with students, but also highlights the empowering possibilities that can emerge from such relationships. June taught urban students of color classified as having special needs. Given the students' positioning in two groups considered "at risk," she may have encountered double resistance. Not only was it likely that they resisted as urban adolescent of color disconnected from the white norms of formal schooling, but they likely also resisted as students who had been labeled cognitively inferior (Slater, 2012; Allan, 2011). Although June adopted a variety of strategies to encourage student participation in lessons, her proleptic view of learners—that is, her unwavering belief that

with appropriate support all students are capable of completing complex tasks even if beyond their current level of ability—seemed to be a critical factor contributing to her success both in developing strong bonds with the students and in boosting their confidence in academic learning. By demonstrating her belief in them consistently while providing the supports and encouragement needed to successfully engage in increasingly complex cognitive tasks, June "came into composition" with her students in ways that moved beyond ensuring their cooperation in lessons. The ways she worked in conjunction with her students actually disrupted, within her class, the normalized category of "special education student."

Interrelational aspects of teaching. All three cases demonstrate the importance of attending to the *inter-relational* aspects of the teaching assemblage. That is, highlighting the ways the components of a particular multiplicity interact and work together can inform our understanding of how first-year teachers construct their practice. For Mauro, June, and Bruce, some of the elements in their assemblages came into composition differently, resulting in developments that diverged from what might have been predicted from initial conditions. For instance, Mauro was teaching in the same school in which he spent his residency year, a condition that has been found to be supportive of first-year teaching (Hebert & Worthy, 2001; Luft & Roehrig, 2005). He was intimately familiar with his school setting, bypassing the common novice stressor of learning the norms of a new organization while starting a career (Sabar, 2004; Stanulis, Fallona, & Pearson, 2002). He also already knew his colleagues, was familiar with the general student population, and enjoyed the support of several other UTR graduates in the

same school community. Despite these favorable circumstances, Mauro experienced extreme challenges with two of his ninth grade classes. The way Mauro *interacted* with students in these two classes and the constraining contextual conditions present (e.g., large class size and mandated testing) combined to produce a teacher-centered instructional style and an authoritarian classroom persona.

June, in contrast, accepted a position that seemed to present multiple challenges from the onset. The school, which had a reputation for being a chaotic setting serving the city's most challenging students, was very different contextually from the school in which she spent her residency year. Moreover, she was responsible for teaching special education biology, although she lacked in-depth preparation for teaching special needs students. Despite these daunting circumstances, the elements in her assemblage combined to produce seemingly unexpected results. The enabling conditions June experienced included multiple levels of mentoring support, small classes, and her deep commitment to social justice and willingness to take risks in teaching, all of which contributed to the enactment of an equity-minded pedagogy.

Bruce and his students provide yet a third illustration of the unpredictability of interactions within assemblages. Given his preservice professors' concern about his ability to relate to students, Bruce's easy relationships with students in his classes were a surprising development. This could be explained by the obvious efforts he put into showing his trust and care for them, combined with the enthusiasm and natural curiosity the students seemed to bring, which in turn meant they were likely to cooperate with his lessons. These circumstances may have provided a measure of support for him and

contributed to his efforts to hold on to some of the elements of his preservice learning, such as occasional projects or student-led problem solving. Had the students responded in less enthusiastic ways to his teaching, Bruce might have abandoned altogether attempts to teach in equitable ways, as many novice teachers tend to do (Allan, 2009; Luft 2009; Saka, Southerland, & Brooks).

A Relational Perspective on Teacher Identity

Adopting the relational view of teaching articulated above and using the connected construct of "assemblage" to discuss teaching practice is a shift away from a view of the teacher as autonomous actor or encapsulated individual that characterizes the positivist, process-product understanding of teacher development that prevails in the literature (Opfer & Pedder, 2011. From a rhizomatic perspective, the teacher is viewed *as* a multiplicity (a dynamic network that includes her beliefs, experiences, and personal qualities) *within* a multiplicity (a part of a larger system comprised of other actors in the school setting, features and conditions of the particular school context, educational policy mandates, among other elements). This notion might also be framed as a systems-level approach to teacher development (Bronfenbrenner, 1976; Davis & Sumara, 2006; Mason, 2008). From a systemic point of view, elements within the **teacher** herself (e.g., her beliefs, background experiences, preservice learning); the **classroom** (e.g., students, content, physical space); the **school** (e.g., school leadership, other teachers, particular school norms); and the **larger district/state/national contexts** (e.g., mandated curriculum, standardized tests, state and national standards) shape the development of teachers and teaching practice. Elements from each of these levels interact with the

teacher to influence practice, thus becoming a part of the teaching-assemblage as well. Each assemblage is also an open system, continuously evolving into forms and generating productions that are new and qualitatively different. Because these influences are ongoing and constantly changing, such a rhizomatic view promotes a vibrant notion of teacher development as continuous transformation, rather than a static view of the teacher as "finished" once she completes her preservice preparation.

What, then, does rhizomatics contribute to our understanding of teacher identity? If the teacher is not seen an autonomous actor, can she develop a stable notion of a teacher-self? As other researchers (e.g., Olsen, 2008; Beijard, Meijer, & Verloop, 2004) have argued, teacher identity is not one single essence or concept. Rather than conceptualizing the self as static, these scholars note that identity is a dynamic and constantly evolving process negotiated between the individual and her present context(s). Perhaps then, the construct of teacher identity itself, the very label of which indicates sameness or being identical (Roy, 2003), is an inappropriate term to describe and analyze what is actually an ongoing process of change.

As an alternative, the rhizomatic concept of *becoming*, introduced in chapter two, can help provide a different view of teacher identity (and teacher development in general). *Becoming*, which in rhizomatic thinking is considered both a noun and a verb expressing change, offers a way to discuss teacher development without implying linearity, consistency, and/or directionality, as stage-based theories do (e.g., Fuller, 1969; Berliner, 1988). Analyzing teacher developments as an ongoing process of *becoming* allows for a

more textured understanding of the multiple, seemingly contradictory identities teachers enact over time.

In this study, the three participating teachers not only developed and enacted multiple teacher selves, but *became-different* in relation to specific constellations of factors and forces co-existing inside and outside their classrooms at any given time. For example, Mauro enacted different selves with his earth science classes than he did his environmental science classes. With his upperclassmen in earth science, a particular conflux of elements came together to influence Mauro's becomings in ways that allowed him, for instance, to adopt a "casual" attitude and a humanizing demeanor. With his ninth grade students, however, conditions such as larger class size and higher student resistance contributed to Mauro's employment of what he considered to be a "strict" teacher-persona in these classes.

As another illustration, viewing Bruce's development as a teacher through the lens of becomings might provide for understanding of identity as an event or occurrence. In other words, viewing identity as a situated action, rather than an essence, may help develop a more nuanced view of this construct. Taking this view would mean no identity existed for Bruce outside of a particular situation. Instead, what I referred to as identity was actually an enactment of a momentary, co-constructed self, responding to a specific set of circumstances at a given time. Stated another way, Bruce's teacher-selves were created on a moment-to-moment basis depending on the influences that existed in the environment at a given time. Thus, in the classroom, Bruce might have enacted a creative and caring persona with his students on days when a particular constellation of elements

coalesced. Perhaps at that particular moment he was feeling less pressure from the principal to act in ways with which he disagreed, experiencing fewer interruptions while teaching, and experiencing success in getting students to responded enthusiastic to the conceptually driven instruction he had planned for them. On other days, perhaps when multiple interruptions occurred during his teaching, students were disengaged from lessons, or the notion of job security was weighing particularly heavy on him, he might appear as a traditional, transmission-focused teacher. These two examples of identity-enactment might be seen as instances of *becoming*.

Constructing a Pedagogy of Equity in Urban Schools

A third theme flowing from this study concerns the construction of teaching practices that challenge entrenched ways of teaching which have historically marginalized students from non-dominant groups, thereby pursuing goals of equity in education and society at large (Cochran Smith, et al., 2009). In the cases of Mauro, Bruce, and June, investigations of the interaction of elements comprising their teaching assemblages as they attempted to enact the type of equitable practices advanced by the NUTR may help to inform thinking about the following question, which was posed earlier in this dissertation study. If many preservice programs promote a pedagogy consistent with principles of equitable teaching, as the literature suggests (e.g., Cochran-Smith, et al., 2009; MacDonald, 2005), why do graduates of such programs tend to abandon the pedagogy they were taught once they become teachers (Allen, 2009; Massengill, Mahlios, & Barry, 2005; Veenman, 1984; Zeichner & Tabachnik, 1981)? Why, despite a wealth of conceptual and empirical research decrying the banking method

(Freire, 1970) of transmission teaching and autocratic classroom dynamics, is this approach to teaching still the dominant pattern in schools, particularly in highly diverse, high-poverty urban areas (Achinstein, Ogawa, & Seiglman, 2005; Haberman, 1995/2010; Singer, et al., 2011)?

As discussed previously in this chapter, translating pedagogical principles learned in initial teacher preparation into classroom practice is a complex, multi-faceted, interactive process involving multiple actors and contextual conditions. However, when translating pedagogy grounded in principles of social justice, yet another layer of complexity exists. The type of equitable pedagogy discussed in chapter two, one version of which was used in the NUTR program, breaks from the ingrained teaching methods that tend to reproduce the existing social order (Freire, 1970; Oakes, 1985). In other words, enacting teaching methods that advance goals of equity in schools means confronting the dominant power structures not only in society but also in schools, which are microcosms of the larger social system (Bourdieu, 1973).

This additional layer of complexity might be illuminated through rhizomatic analysis. In rhizomatic terms, dominant power structures are “molar lines” or rigid forces that bind social activity to the existing order (Deleuze & Guattari, 1987). Molar lines include institutional structures that reinforce the norms of schools (Albrecht-Crane & Slack, 2003), such as the bell schedules, mandated testing, curricular standards, and/or bureaucratic dysfunction. Molar lines also encompass discourses (such as the types of knowledge that are privileged in school settings or “tracks” to which students are assigned) and beliefs (e.g., traditional notions of teaching as “telling” or good students as

quiet and obedient) that teachers and students may internalize (Strom & Martin, 2013). However, molar lines depend on actors in the setting to translate them into day-to-day actions. Molar lines are just the rigid "overcoding"—the actual work must be carried out by supple, molecular lines. Because these lines are flexible, they might enact the normalizing work of dominant power structures and discourses or break from the status quo and become "lines of flight" (Deleuze & Guattari, 1987). As suggested previously, the work of the teacher is *molecular*. That is, although her work is stratified by many molar lines, which might be internal to the teacher herself, present in her classroom, and/or imposed from the school, district, and state/federal policy mandates, she has some fluidity in her day-to-day actions.

Within this fluidity, possibilities always exist for momentary escape, a break from the status quo of instruction. These escapes might take the form of a conversation in class that fuses the academic content and students' personal lives, a moment of student-teacher connection that transcends their traditional roles, or a student's surprised and excited shout in reaction to a demonstration of scientific phenomena. Such escapes are temporal—the class must end, the lesson objective must be met, or the teacher once again must assume the role of the class authority. Yet, in returning to the molar norms of practice, a shift or mutation has already occurred in the overall system. Although it may be too small to produce any discernable change at the actual moment it happens, if constructed and re-constructed over time, this infinitesimal shuffling of molar lines produces changes on a greater scale. These larger changes might be realized as eventual transformations over time, such as the gradual shifting of social attitudes over the last

several decades toward issues such as gay marriage. Alternately, lines of flight may contribute to the gathering of a critical mass or tipping point leading to social movements. As Deleuze and Guattari (1987) explain, “The profound movements stirring a society present themselves in this fashion…from the viewpoint of micropolitics, a society is defined by its lines of flight” (p. 216). In this way, rhizomatics provides a theory of social change that might be applied at the level of the classroom. Such a theory may help us understand the terrain of teaching in urban schools for new teachers and the process of enacting practices grounded in principles of equity and social justice.

All three teachers in this study faced settings characterized by rigid spaces comprised of many molar lines, such as challenging class assignments, a lack of support, and/or bureaucratic dysfunction. Yet the ways the teachers perceived their contexts and responded and interacted within their settings—that is, the molecular work these teachers and their students carried out, in combination with other influences in their respective settings—seemed to shape the construction of their teaching practices. Mauro, for example, taught two different science content areas, both of which were lower-track. His ninth-grade assemblages were characterized by both difficult contextual circumstances (such as being a tested subject, large classes, and Mauro’s own newness to the subject) and challenging student interactions. These served as normalizing forces contributing to Mauro’s production of teacher-led instruction and autocratic classroom management. Thus, Mauro’s interactions with his ninth grade students reinforced the work of the molar—that is, within these classes, Mauro’s teaching methods tended to reproduce entrenched patterns of transmission-like teaching. While this description characterizes

Mauro's classroom interactions during the time I observed his ninth grade classes in the first few months of his teaching career, lines of flight or momentary breaks from the transmission approach to teaching that characterized his practice within the context of his ninth grade classes, were also visible at times. While those lines of flight did not materialize into larger scale changes during the data collection phase of this study, such transformations may have been evident over a longer time span.

In contrast, Mauro's earth science classes presented elements that, when interacting with his attempts to enact NUTR pedagogy, created a "smoother space" (Deleuze & Guattari, 1987) for constructing a practice that broke from the customary transmission based teaching in urban schools. In Mauro's day-to-day activities with students in his earth science classes, multiple lines of flight were evident in my observations. Through his problem-posing pedagogy and experiential learning activities, Mauro's classes were replete with questions and opportunities for students to think about and make sense of the ideas to which they were exposed. This represents a break not only from the traditional model of teaching as a uni-directional transmission of information from teacher to student, but also with the conception of knowledge as coming from "without," or existing outside of the learner (Dewey, 1938, p. 17). Students were invited to draw on their prior knowledge and experience and engage with one another within the structure of learning activities Mauro had created to actively engage them in making sense of new ideas. This pedagogy positioned them as knowers and thinkers, rupturing the molar category of "students of low-track science" and the "cognitively deficient" implication that accompanies such a classification (Oakes, 1985/2005). Alongside these

instructional lines of flight, Mauro and his students worked jointly to co-construct an open learning environment, allowing for side conversations that helped create strong bonds between teacher and students. These temporary connections between Mauro and his earth science students momentarily blurred the student/teacher binary, transforming them into student-teachers and teacher-students (Freire, 1970). That is, they temporarily broke out of their molar identity categories into a "third space outside the binary of teacher and student that yet allows for the subjectivity of both" (Schapiro, 2009, p. 423). Reconstructed over time, these lines of flight in Mauro's earth science classes supported his ability to enact practices underlined by principles of equitable teaching.

Bruce's case illuminates the conflict that can develop from attempting to translate notions of equitable pedagogies into practice while simultaneously constrained by internal and external molar lines. In other words, Bruce's teaching was not just "overcoded" by difficult contextual elements—such as the dysfunction of the school, the lack of resources and consistent instructional support, and a tumultuous change in school leadership—but was also stratified by normalizing forces within him in the form of traditional beliefs about teaching and performance-related fears of straying too far from the norm of instruction. The combination of molar lines at both the institutional and individual levels worked to reinforce the construction of practices that adopted/mirrored many characteristics of traditional teaching, such as separating conceptual and procedural aspects of physics, administering frequent tests, and introducing ideas to the class as a whole through lectures and the presentation of problems.

Yet, despite the rigid circumstances Bruce faced, both internally and externally, he did not abandon his preservice learning entirely in favor of transmission-based, authoritarian teaching practices, as is commonly reported in the research literature on novice teachers (Allan, 2009; Saka, Southerland, & Brooks, 2009; Veenman, 1984; Zeichner & Tabachnik, 1981). Although such instructional strategies appeared inconsistently, his lessons nevertheless included the occasional use of experiential learning in the form of "break-out demonstrations" of physics phenomena, collaborative student-led problem solving, and inquiry-based labs. These strategies provide evidence of the supple, molecular lines present at the classroom level that characterize the day-to-day activity of teachers and their students. As discussed earlier in this study, although Bruce's molecular work approximated traditional instructional norms, lines of flight also occurred, such as those that contributed to the generally supportive relationships he cultivated with his students.

June's account provides a particularly hopeful example of what is possible even when facing seemingly extraordinary stratification. Despite the previously noted molar lines within her setting that seemed likely to constrain her teaching (such as the challenging school population and her lack of preparation to teach special needs students), the multiple levels of support she received, June's own commitment to social justice and willingness to take initiative, and the small classes she taught were contextual conditions providing for a "smoother" space in which to enact equitable teaching practices. Within this space, June pursued lines of flight in her teaching that disrupted the normative category of "special needs student." Relying on collaboration to address her students'

needs, June also interrupted the customary practice of equating a successful student with being an autonomous learner. As her students experienced success and gained confidence, they became more willing to participate actively in her lessons and attempt instructional tasks pitched a high-level learning—evidence of a larger change in the local stratified system.

To view the construction of an equitable pedagogy as lines of flight, consideration must be given to the unpredictable nature of the process of enacting this type of pedagogy. Because the work of the teacher occurs in a stratified space, rigid with molar lines, escapes and breaks from the status quo occur unpredictably, in fits and starts. Thus, the construction of an equity-oriented pedagogy is not likely to be smooth. Given the nature of the molar lines they must navigate, it is highly unlikely that we might enter a new teacher's class in the first months of her career and see her working with students seamlessly to collaboratively generate critical, open-ended questions about scientific phenomena. However, when enough lines of flight occur, each of those lines feeds back into the system, creating small shifts, which over time can transform the system.

Summary

In sum, using a rhizomatically-informed conceptual and analytic lens in this study drew my attention to three meaning-making processes in which all three study participants engaged. I argue that these three recursive, interactive, and contextually situated processes—translating their preservice learning into action in their new classrooms, negotiating with students for participation and cooperation, and constructing/enacting teacher selves—comprised their construction of practice. Using

these three processes as a starting point, I argued that the connection between preservice learning and enacting practice is non-linear and complex; the nature of teaching is relational and inter-relational, and thus is co-constituted by a variety of contextual and human components; and enacting a pedagogy of equity means pursuing “lines of flight,” or breaks from the status quo, within an overall rigid context. Next, I take up these contentions within the broader arenas of teacher education, schools, educational policy, and research, offering implications and recommendations based on insights from the study.

Chapter Eight: Conclusion

In the final chapter, I draw implications and offer recommendations from the findings reported in the three case studies of Mauro, June, and Bruce. I first discuss ways that teacher educators and teacher education programs can prepare future teachers to grapple with the relational, negotiated process of translating their learning into classroom practice. I follow this with suggestions for schools and school districts to more strategically support new teachers during the novice phase. I conclude with a discussion of implications for viewing teaching as non-linear phenomena for educational policy and research.

Implications and Recommendations for Teacher Education

The findings from this study suggest that teacher preparation programs do not have a linear, causal connection to the practices eventually enacted by graduates in their classrooms. As shown, preservice teacher learning is one of multiple influences on the teacher, including her personal beliefs about teaching and learning and experiences as a student. Beyond the teacher herself, a host of setting factors also influences her eventual classroom practices. I contend, however, that preservice preparation has the potential to be a more powerful influence in future teacher-assemblages than it currently seems to be. Specifically, I suggest that by more closely connecting university courses and clinical practice through apprenticeship and by purposefully attending to the relational aspect of teaching, programs of teacher preparation can more strategically support future teachers in their enactment of equitable pedagogy.

Closely connecting coursework and practice through apprenticeship. The three teachers featured in this study received their professional preparation as teachers in a program that differs substantially from the typical university-based teacher education program. Specifically, they were enrolled in a "hybrid" program set in an urban context, guided by principles of equitable teaching, and taught in an integrated, ecological format (Klein, et al., 2013). Each of the three teachers also spent an entire year in a clinical apprenticeship at an urban school, receiving intensive mentoring from both a school-based teacher and university faculty members who worked together as a team to collaboratively design the content of their preparation. While a direct, linear relationship cannot be drawn between this "residency" year and the eventual teaching practices constructed by the three teachers, each exhibited clear benefits from this prolonged period of guided practice in settings similar to the ones in which they would eventually teach. In fact, Mauro's initial teaching assignment was in the same school in which he did his residency.

June credited her preservice internship as providing her with knowledge and experience for planning and executing inquiry-based units, which later contributed to her leadership role in her PLC. Working with urban students for an entire year also provided groundwork for building the relationships that would be critical to her own as well as to her students' successes throughout the duration of this study. Mauro's demonstration of facility with the "Understanding by Design" framework and his experiences planning earth science curriculum during his year of clinical practice contributed to his being asked to lead the earth-science curriculum mapping and collaborative planning in his

school/department. He also learned to differentiate his lessons and teach via small group instruction, a method he adopted from his residency mentor that helped him meet the needs of the range of learners in his classes (although this admittedly occurred in his earth science classes more often than his environmental classes).

In contrast to Mauro and June, Bruce experienced a more complicated relationship with his preservice learning. While circumstances in his school context may have contributed to a partial "washing out" of the type of practices learned in the NUTR (Zeichner & Tabachnik, 1981), Bruce still clung to some aspects of his pedagogical preservice preparation, suggesting that changes in beliefs about teaching—even when deep-seated—are possible. He refused to completely give up on views of quality teaching developed in the NUTR, even in the face of losing his job. As he stated in my last interview with him, "If [the principal] wants me to be completely traditional, maybe this isn't the best place for me."

The experiences of the three teachers in this study, although to varying degrees, support educational scholars' and teacher educators' calls for increased connections between coursework and clinical practice (e.g., Zeichner, 2010; Feiman-Nemser, 2001) and more intensive, lengthy fieldwork experiences (Bransford & Darling-Hammond, 2005) during initial teacher preparation. If translating teacher learning into classroom practice entails recursive cycles of meaning-making between teachers, their students, and their context, sustained opportunities to practice that type of contextual negotiation while being supported by expert others are critical. In short, teaching practice that surpasses superficial appropriation takes time to develop, as Britzman (1991) suggests in the title of

her seminal study, “Practice makes practice.” Although the three teachers featured in this study were by no means “finished” products when they entered the classroom—that is, their development and learning were ongoing—a year-long, integrated, contextualized, and supported apprenticeship experience seemed to contribute to the translation of at least some of the components of their preservice preparation into their first year practices, even in the most constraining of environments (e.g., in the case of Bruce).

Research on preservice preparation shows that many universities are working to more directly tie teacher learning in courses to field experiences in schools (Cochran-Smith & Villegas, in print) and to increase the actual amount of time teaching candidates spend in clinical practice before entering the classroom as a teacher of record (Bullough, Draper, & Young, 2004), thereby moving a step closer to an apprenticeship model. Yet many teacher education programs retain the traditional separation of preparation into two separate stages, one involving coursework and one encompassing a field-based practicum (Grossman, Hammerness, & McDonald, 2009). For a variety of reasons, such as the operation of the university and school as separate entities, the lack of communication and collaboration between them, and their pursuit of disparate agendas (Valencia, Martin, Place, & Grossman, 2009), student teachers’ experiences are rarely consistent with their coursework (Zeichner, 2010a). Such disconnects perpetuate what researchers have termed the *theory/practice divide* (Feiman-Nemser & Buchmann, 1985; Grossman, Hammerness, & McDonald, 2009) and ultimately reinforces the status quo of teaching.

Yet, the idea of a binary separating the realms of university coursework and practical experiences in schools speaks to a gap between theory and practice that does not

really exist. Rather than existing as discrete entities, theory and practice are interdependent, always informing the other (Butler, 2004; Taguchi, 2007). As Taguchi (2007) notes, "We are *already* speaking and performing theory into (this messy) existence of practice" (p. 278). Stated simply, theory is never absent in practice. For example, multiple theoretical notions undergird the type of transmission-based, authoritarian instruction that still tends to characterize teaching in urban schools. These might include a positivist view of knowledge as static and fixed (Hinchey, 2000; Giroux, 2009), a behaviorist conception of learning (Skinner, 1976), and an understanding of the teacher's role as keeping students docile and obedient (Foucault, 1976). The term *theory-practice divide*, then, does not really express a general separation of theory and practice, but rather is intended to communicate a disconnect or mismatch between specific educational theories/theoretical perspectives learned in preparation programs and the teaching practices that actually get enacted in schools.

In light of the theory-practice interdependence, and in keeping with a paradigm assuming students of teaching do not arrive as blank slates, but rather bring deep-seated beliefs about how to teach (Lortie, 1975; Pajares, 1992; Richardson, 1997), tighter connections between coursework and fieldwork may help them gain awareness of, and problematize, the implicit theories they bring with them to their initial teacher preparation (such as those theoretical notions noted above that underline more traditional teaching models). Taguchi (2007) discusses this process as "a continuous process of packing and unpacking" the "toolbox [students bring] already filled (and constantly refilling itself) with tools needing to be unpacked, investigated, and reformulated" (p. 279). Rather than

believing they are entering their teacher preparation programs ready to be filled with the "correct" knowledge about teaching, future teachers can be helped to recognize the beliefs and theories about teaching and learning they do bring and begin the work of problematizing those unarticulated theories in their internal "toolbox" in light of ideas to which they are exposed in their preservice programs. With simultaneous opportunities to act on this new learning through field experiences, future teachers can extend this problematizing to enacting instruction in the classroom. One way this work might take shape is for future teachers to engage in recursive cycles of inquiring into learning theory with classmates and their instructor(s), enacting that learning in a practice setting, and returning to their class(es) to discuss, reflect, and problematize their experiences (Taylor, Klein, Onore, Strom, & Abrams, forthcoming).

The cycle of theorizing and practicing allowed by such models of teacher preparation has multiple benefits. For one, it draws future teachers' attention to an example of social constructivism in action, illuminating their own ongoing processes of constructing and reconstructing knowledge in social settings (Vygotsky, 1978). Recursively moving between opportunities to learn theory and "put it to work" in a classroom also allows the problematizing of the overall pedagogy they are learning when enacted in particular contexts. This process may help address the "reality shock" or "praxis shock" new teachers tend to experience as they struggle to put their preservice learning into practice in their new schools (Chubbock, 2008; Rushton, 2001; Smagorinsky, Gibson, Bickmore, Moore, & Cook, 2004; Veenman, 1984). In traditional university-based teacher preparation programs, students often learn about theory and

method free of context and in idealized form (Loughran, Korthagen, & Russell, 2006). When they move into their new classrooms, however, they face the task of moving that decontextualized, utopian vision of practice into action, with particular populations of students, in a school context that may or may not support the type of pedagogy they learned in their preservice programs, and within a larger educational policy landscape stressing standards and accountability.

As I have previously suggested, the major work of first-year teachers, then, is to take their preservice learning and *translate* it, fitting it the best they can into their new school settings. Thus, in addition to teaching about educational theory and methods, teacher education programs have a responsibility to prepare their graduates to address the phenomenon of "praxis shock" by helping them problematize the ideal notions they are learning. As mentioned above, in programs that tightly connect coursework and fieldwork or feature simultaneous learning/practice experiences, students of teaching might focus on inquiring into, reflecting upon, and collaboratively discussing problems encountered in trying to close the gap between their learning and what they are actually able to do in classrooms. In programs that offer separate or more disconnected coursework and practical experiences, however, future teachers can still problematize the ideas they are learning through the use of richly descriptive case studies of teaching practice and videos of actual teaching practice.

While teacher preparation programs seem to be making progress toward increasing the time teacher candidates spend in practice and more closely connecting coursework to field experiences, the proliferation of alternate route teacher certification

programs (Darling-Hammond, 1990, 2009; Zeichner 2010b) may present an obstacle to these efforts. Created to address teacher shortages in high-needs areas, alternate route programs place individuals with little or no professional preparation into classrooms as teachers of record (Baines, 2010; Darling-Hammond, 2006; Darling-Hammond, 2010). Teachers entering the classroom though alternate routes normally must complete teacher preparation coursework within the first few years of teaching to be fully certified to practice (Chin, Young, & Floyd, 2004), but the quality of this preparation varies widely (Darling-Hammond, 1990; Darling-Hammond, 2010). Upon first entering the classroom, then, alternately certified teachers bring little or no pre-professional preparation in teaching with which to negotiate their classroom experiences. Thus, the component of pedagogical knowledge—which was shown in this study to be a mediating factor of teaching practice in all three of the cases presented—is likely to be absent from the teacher multiplicity, or teacher system, to help shape their resulting teaching practices. This may mean that the primary influence on instructional practice from the teacher herself may be her own previous experience as a student and beliefs about teaching and learning emerging from that experience, a factor that is likely to reinforce traditional norms of instruction (Lortie, 1975; Pajares, 1992), a concern given that the overwhelming majority of alternately certified teachers work in high-poverty urban schools (Darling-Hammond, 2010).

Attending to the relational aspect of teaching practice. This study suggests that teaching does not happen in isolation from other contextual elements; nor does it occur as a controlled action of an autonomous agent. Rather, it is a relational, highly

interactive process (Britzman, 1991; Bullough, 1997; Bullough, Draper, & Young, 2004) involving a variety of factors, including multiple actors, discourses, and contextual elements/site-specific influences. Yet, the very foundation of Western logic undergirding the type of knowing that supports the collective capitalistic mindset stresses individual agency (St. Pierre, 2004). Neoliberal common sense, which in its current form stems from the rationalism of the Enlightenment (Giroux, 2009), tells us we are thinking subjects who define our existence by that well-known Cartesian statement: "I think, therefore I am" (St. Pierre, 2000). Such thinking perpetuates the idea that we are encapsulated bodies with the ability to control outcomes. Rather than being seen as part of a larger multiplicity producing change through the interaction of its parts, the individual is "endowed with a will, a freedom, an intentionality, which is then subsequently expressed in language, in action, in the public domain" (Butler, 1995, p. 136). Transported to the classroom, this perception becomes an expectation that a teacher will be able to plan and execute instructional practice while "managing" or "controlling" students. With such an expectation, it is no wonder new teachers experience extreme shock as they transition from their pre-professional programs into teaching and encounter difficulty "transferring" their preservice learning (Cook, 2009; Huberman, 1989; Korthagen, Loughran, & Russell, 2006; Veenman, 1984).

Shifting from an "I" mentality to a more multiplistic perspective of teaching necessitates not only belief change about teaching and learning, but also a fundamental shift in the way most individuals in our society perceive the world. To help future teachers build awareness of the interrelated activity that will characterize their future

teaching, teacher educators should make the process of negotiating with students a centerpiece of learning to teach. That is, teacher educators might give substantial attention to discussing the relational aspect of teaching and incorporating activities that highlight the ways multiple elements of particular educational contexts shape teaching practice. For example, teacher candidates attending programs offering simultaneous coursework and clinical practice might receive a course assignment that requires them to design a lesson, identifying the pedagogical practices involved, and teach the lesson. Afterward, the teacher candidates can craft a reflection that specifically attends to the ways in which they "translated" their original plan into action based on negotiations with their students. To further illuminate modifications made based on the needs and responses of their students, teacher candidates might also revisit their initial lesson plan and annotate it to reflect the ways they negotiated this plan in context with their students. Finally, the beginning teachers might bring their observations and reflections back to share with their class(es).

For individuals receiving preparation that separates learning opportunities into coursework and field experiences, "approximations of practice" (Grossman, Compton, Igra, Ronfeldt, Shahan, & Williamson, 2009, p. 2076) that simulate learning situations may be helpful. For instance, students may be assigned to teach a lesson in pairs or small groups, and afterward the class might discuss particular pedagogical principles and how they were realized (or not) through the lesson. While such simulations may not provide teachers with the opportunity to discuss the navigation of various structural or other

contextual constraints on their teaching, the exercises can highlight the individual meaning making of the teacher with her students during lessons.

As another way to illuminate the co-constructed nature of teaching, teacher educators might model for teacher candidates the type of pedagogy they are asking them to enact as teachers (Russell, 1999). If a teacher education program promotes a constructivist view of learning—as a growing number of programs currently do—teacher candidates must directly experience learner-centered, collaborative instruction (Villegas & Lucas, 2002). Such experiences are especially important for teacher candidates who enter their preparation program with traditional beliefs about teaching and learning. Beyond this, future teachers also need opportunities to discuss and analyze teaching episodes to gain insight into the kind of in-the-moment co-construction that occurs in learner-centered teaching. As an example of how this might be operationalized in teacher education coursework, Berry and Loughran (2002) offered their own instructional moves up for their students' critique, facilitating discussions about the pedagogical reasoning of the teacher. In a teacher education course dedicated to this type of learning experiences, the course leader might also draw attention to the ways that her teaching was modified in response to students' needs, participation, and reactions to further emphasize the collaborative nature of constructing practice.

Framing the work of the teacher as relational also offers the opportunity to reexamine more traditional notions about teaching from different angles. For example, new teachers frequently cite "classroom management" as one of their most pressing instructional concerns (Chubbock, 2008; Birrell, 1995; Romano, 2008; Hargreaves &

Jacka, 1995; Veenman, 1984). Urban teachers, in particular, often struggle with maintaining order in the classroom (Milner & Tenore, 2010), for reasons Weiner (2003) illuminates in her review of research on classroom management in urban schools. For one, the schools themselves tend not to offer support to teachers in creating the type of environment needed to build supportive classroom communities. In addition, the growing differences in the cultural background between teachers and their students common in urban schools, and high rates of student mobility as well as other factors that cause environmental instability, are likely to interfere with the ability of teachers to form strong relationships with students, another critical factor in building a classroom community. Finally, deficit paradigms about students and custodian views of "managing" students are often so ingrained into the fabric of schools that teachers themselves do not recognize them (Ibid).

Although some researchers have advocated for classroom management that works to address the social needs of culturally diverse students in urban schools (Brown, 2004; Milner & Tenore, 2010), the problem remains that the concept of "classroom management" itself is not a "culturally neutral" term, but rather a "white, middle-class construction" (Weinstein, Tomlinson-Clarke, & Curran, M. 2004, p. 26). Further, the very language of classroom management invokes a managerial metaphor that echoes traditional authoritarian teacher roles. Despite the best intentions of teachers, the very ways in which we think about classroom management may reproduce discriminatory patterns and ignore cultural differences, factors likely to contribute to student resistance to learning (Hand, 2010; Ogbu, 1986).

Teacher educators might purposefully seek to rupture this mode of thinking by having students of teaching unpack the meaning and implications of "classroom management," interrogate their own beliefs and experiences with the construct, and try on new concepts that emphasize relational notions of social interaction and community dynamics rather than control. Alongside such explorations, the cultural disconnects and power imbalances that may contribute to student resistance to learning or oppositional school behavior might be explicitly examined, as well as ways for teachers to negotiate power with students (Foucault, 1980; Brubaker, 2009) and support them in learning the rules of "the culture of power" (Delpit, 1988, p. 282).

Implications and Recommendations for Schools

As noted above, preservice preparation—while having the potential to influence teachers' instruction—is only one component of the teacher multiplicity, which in turn is only one part of the larger teaching-assemblage that collectively shapes the teaching practices that are produced. As Hargreaves and Jacka (1995) note, "It is clear that teacher education reform will continue to be a frustrating and futile endeavor until there is fundamental change in the cultures and contexts of schooling that beginning teachers encounter" (p. 60). In other words, for completers of teacher education programs to become effective teachers, schools need to address the myriad problems that present huge challenges for beginning teachers. For example, in contrast to many other professionals, teachers are expected to take on all the same duties as seasoned veterans from the first day they set foot in their classrooms (Huling-Austin, 1996), even though they are at an early point in their development (Feiman-Nemser, 2001). Adding to the problem, new

teachers are likely to receive the most difficult classes (Hargreaves & Jacka, 1995; Scherff, 2008; Tait, 2008), feel isolated and alone (Fantilli & McDougal, 2009; Griffin, Kilgore, & Winn, 2009; Stanulis, Fallona, & Pearson, 2002), and many experience conflict between their entering pedagogical beliefs and those promoted by administrators and/or other teachers in the schools where they teach (Flores & Day, 2006; Chubbock, et al., 2001; Southerland, Saka, & Brooks, 2009).

Such conditions, combined with other realities, such as the systematic defunding of public education, the proliferation of standardized testing, and the punitive turn of teacher evaluation, constitute part of the "overcoding" (Deleuze & Guattari, 1987) of the institution of schooling. These are molar lines, or forces that normalize teaching, making it difficult to enact practices grounded in social justice simply because teachers are too focused on their own survival (Chubbock, 2008). Instructional leaders within schools must become advocates for first-year teachers, making use of the resources at their disposal to help novices navigate the striated terrain of their settings. School leaders must also understand conditions that both enable and challenge new teachers to develop effective pedagogical practices. Such advocacy might mean easing some of the strain on new teachers by ensuring they are not assigned to teach lower-track or "remedial" courses, or decreasing teacher isolation by cultivating a professional learning community within a department.

Another very important school support involves offering new teachers induction and mentoring. Although two of the three teachers taking part in this study reported their mentors were somewhat helpful in navigating issues in their first year of teaching, their

mentoring situations generally paralleled those found in the novice teacher literature in terms of mismatch and inconsistent support (e.g., Castro, Kelly, & Shih, 2010; Fry, 2007; Stanulis, Fallona, & Pearson, 2002). Mauro's mentor taught a different area of science than he did and his induction coach was a retired English teacher. June's mentor was "non-existent," and her induction coach taught music on a part-time basis. Bruce's mentor was a middle-school life science teacher with little physics content knowledge, and his induction coach was a retired second grade teacher who provided little support.

Given that the first year of teaching is a period that profoundly influences teachers' practices as well as their decisions to remain or leave the profession (Ingersoll & Smith, 2004), districts and schools must create consistent and coherent induction programs that provide supports for new teachers, including appointing mentors who are qualified and appropriately matched to their mentees. Such supports are imperative to help teachers continue to develop their pedagogical knowledge and skills and to assist the continual meaning making processes, negotiations, and school site navigations that occur as the teacher moves into the classroom. This means investing in induction programs and designing them to specifically help novice teachers close gaps between their preservice learning and the realities of their new settings.

Designing an induction program focused on the translation of pedagogy new teachers learned as part of their preservice preparation provides powerful possibilities for learning in and for practice (Lampert, 2010) or for using the teacher's current practices as the basis for learning, while also creating a community of support for them. For instance, a mentor/induction coach might work with a group of teachers to design an action

research project or inquiry cycle to investigate a problem of practice identified by each teacher. Focusing on this challenge, each teacher could formulate an initial plan to modify her own teaching, and collect data on the results of those modifications. After reflecting on the data, the induction group would reconvene and teachers would share their initial results with each other. Based on their preliminary results and dialogue, teachers would then return to the classroom to modify their practices again. Making deliberate space for this type of learning to continue in schools is yet another way school and district leaders can advocate for and support their new teachers.

Implications and Recommendations for Policy and Research

Beyond the implications and recommendation for teacher education and schools discussed above, this study also offers insights into educational policy and research related to teachers and teacher education. In terms of educational policy, I argue that efforts focused on accountability must press beyond reductionist, "impoverished" methods of evaluating teachers and teacher preparation programs that focus on skewed outcomes (Cochran-Smith, 2003, p. 4). I also make a case for a research agenda that investigates teaching as complex phenomena, shifting away from its current outcomes-oriented focus to emphasize the ontology of teaching.

Implications for educational policy. Educational policies of the United States are grounded in a positivist, rationalist mode of thinking characterized by a belief in the complete autonomy of the individual and the unerring righteousness of capitalist principles. Deleuze and Guattari (1987) characterize this type of logic as "arborescent thought." Although such reductionist thought structures have long undergirded school

norms, such as the ranking grade system, separation of subjects, and traditional roles of the teacher and student (Foucault, 1976), in the last decade an increasingly individualistic, neoliberal mode of thought in education policy has spawned an even more problematic trend known as the "corporate education reform movement" (Karp, 2012). The movement's moniker refers simultaneously to the market principles informing its efforts and the business interests funding it (Ravich, 2010, 2013).

One of the ways the corporate education reform agenda has insinuated itself is through "accountability" schemes that measure students for productivity through various forms of high stakes testing (No Child Left Behind, 2002; Race to the Top, 2010). Although many scholars argue the tests are culturally and linguistically biased (e.g., Au, 2008; Darling-Hammond, 2007) and financial disparities between school districts mean students are competing on unequal terrain (Baker, Sciarra, Farrie, & Center, 2010), schools that do not meet particular achievement benchmarks on these tests are labeled as "failing" and subject to various sanctions (Lipman, 2004). As an extension of these policies, the recent Race to the Top initiative promoted by the federal government require states to develop evaluations providing for the quantitative assessment of teachers (Race to the Top, 2010). In response, several states have adopted policies that purport to hold teachers accountable for their performance based on the "value added" to students, as measured by test scores (Butrymowicz & Garland, 2012). Other states, like New Jersey, have announced their intention to begin using measures of student performance known as "Student Growth Outcomes" to make decisions about teachers' contract renewal, tenure, and dismissal, despite the measures' unsuitability for this task (Baker, 2012). The next

step in the accountability chain is to hold teacher education programs responsible for the performance of their graduates by linking those institutions to their graduates' evaluation scores as they begin teaching (Knight, Edmonson, Lloyd, Arbaugh, Nolan, Whitney, & McDonald, 2012). Indeed, the 2011 "Our Future, our Teachers" report released by the Obama administration calls for such a measure (U.S. Department of education 2011), though no formal federal policy has been created yet (as of this writing) due to disagreements among members of the "rule making committee" convened by the administration to write the legislation (Cochran-Smith, Piazza, & Power, 2013).

While a discussion of the psychometrics of these measures is beyond the scope of this study, the non-linear, collaboratively negotiated processes of constructing teaching practices described here suggests that using so-called "value added" or "student growth outcomes" measures to evaluate the performance of individual teachers and, by extension, to determine the effectiveness of their university-based preparation programs, is highly problematic. As this study shows, while each participating teacher's preservice learning was certainly an influence on their practices, that knowledge was only one of many factors playing a part in their first-year teaching. These findings—which are consistent with empirical research reported by others (e.g., Cochran-Smith, 2001; Davis & Sumara, 1997; Elmore, 2002; Opfer & Pedder, 2011; Starkey, 2010)—attest to the complex, non-linear nature of teacher learning and practice, and suggest that evaluation schemes that *equate* teacher preparation program quality and individual teacher effectiveness with student test scores are unfounded (Cochran-Smith, 2003).

As several educational researchers have concluded, “value-added” models of teacher effectiveness and teacher education quality as well as other reductionist, linear quantitative models hold little or no value for informing teaching practice or the reform of teacher preparation programs at local levels (e.g., Cochran-Smith, Piazza, & Power, 2013; Zeichner, 2011). Rather than producing information which might help teachers, instructional leaders, teacher educators, and programs of teacher education address important and persistent questions, these measures force its subjects into simplistic binaries, such as good/bad, right/wrong and failing/not failing (Cochran-Smith, 2003). Said differently, instead of yielding important knowledge for the field of teaching and teacher preparation, such outcomes-based evaluations of teacher preparation program and teacher quality produce skewed, black-and-white labels with little purpose other than to feed the neoliberal rhetoric of “accountability” at best (Cochran-Smith, Piazza, & Powers, 2013) and at worst, to support a deregulationist agenda that discredits teacher education and the public K-12 school system and calls for their dismantling (Zeichner, 2003; 2010b).

From a rhizomatic perspective, the idea of using assessment for quality control is itself a molar line. That is, the evaluation of programs and teachers for the purpose of determining who/which is good or bad is a structure intended to normalize and “discipline” teachers. In their current forms focusing solely on outcomes, quantitative educational evaluation systems are also *closed*—that is, they do not allow for new growth or transformations (Mason, 2008; Davis & Sumara, 2006). When faced with punitive consequences if their students do not achieve pre-determined benchmarks on their state-

mandated assessments, teachers are likely to become more conservative in their practices, and less likely to "experiment" (e.g., the way Bruce described enacting inquiry based or learner centered instruction). This phenomenon may be even more extreme in urban settings with large populations of minority, high-poverty, special needs, and English learner populations, who have historically performed at lower levels than their white, suburban counterparts on standardized achievement tests.

Representing the complexity of teaching is a seemingly impossible task for many reasons, one of which is the conflux of influential elements at multiple system levels (teacher, classroom, school, district, state/federal). How, then, might teacher practice and teacher preparation programs be assessed to take into consideration its non-linear relationship? While there is no easy "answer" or "solution" to this question, I offer three suggestions for assessing teaching in ways that better attend to its inherent complexity. First, assessments of teaching should include an *ontological* focus. That is, assessments of teaching practice must actually attend to how the practices are constructed or carried out so they can inform future changes. Second, the goal of the assessment should not be to punish teachers or normalize her practice. Instead, the focus should be providing support for teacher growth. This shift recognizes that teaching practice is not fixed, but is an ongoing and constantly evolving process. Third, because of the ever-becoming nature of teaching, multiple assessments should be conducted over a sustained period.

In the past several years, researchers have proposed more multi-faceted, qualitative assessments of teaching practice at the preservice and in-service level that speak to aspects of these suggestions. For example, the Framework for Teaching (FFT)

(Danielson, 2007) is a widely used teacher evaluation system that reflects a constructivist stance. Each assessment cycle, designed to promote professional development, requires a pre-observation conference, an observation of teaching practice, and a post-observation conference, helping the assessor make connections between the teacher's original planning, the practices that enacted, and the ways these were negotiated in context. Further, the assessment process is ongoing, occurring approximately six times in a year (Ibid). Although the FFT is used widely across the country in school districts such as Chicago, Illinois and Newark, New Jersey, it is often employed in substantially modified form as part of new accountability policies (such as using a simplified rubric, failing to conduct pre- and post-observation conferences, and administering fewer than the expected six assessment cycles), thereby reducing the potential benefits that could be derived from the use of this assessment system.

Another multi-faceted approach to teacher evaluation is the Teacher Performance Assessment (TPA), a system recently introduced by the Performance Assessment for California Teachers' (PACT) for initial certification (Performance Assessment for California Teachers, 2013). Taking a portfolio approach, the TPA assesses a battery of skills for beginning teachers, including the development of lesson plans, implementation of practice, assessment of learning, and reflection on teaching (Darling-Hammond, Newton, & Wei, 2013). A variety of sources, including videotapes of lessons, lesson plans, written reflections, and student artifacts are used to assess these proficiencies. Its drawback, however, is the external evaluation component. Although PACT promises that it's evaluators are educational professionals of different backgrounds who undergo

extensive training that results in high levels of inter-rater reliability (Darling-Hammond, Newton, & Wei, 2013), the evaluation is ultimately handled by a large, well-known for-profit educational corporation, a move which some researchers have critiqued (e.g., Cochran, Powers, & Piazza, 2013).

Implications for Educational Research

During the past 15 years or so the educational research community has experienced a resurgence of positivist, quantitative research, which has come to be considered the methodological "gold standard" (National Research Council, 2002; St. Pierre, 2011). In fact, a 2004 Institute of Education Sciences (IES) report called for "a new generation of methodologically rigorous and educationally relevant research" that would counteract the profusion of qualitative research in education, which they believed was "a clear sign of the mismatch between the focus of the practice community and the current research community" (Lather, 2006, citing IES, 2004). According to this report, psychometrics and statistics research is the only way to address persistent issues in education. Other reports and legislation in the last decade, such as No Child Left Behind's (2001) statement on quality research and the National Research Council's 2002 report, *Scientific Research in Education*, have echoed the calls for quantitative, mainly experimental research designs that perpetuate the "regime of truth" of objectivity and generalizability in education (Lincoln & Cannella, 2004).

In an era of both market-driven reforms and a backlash against divergent forms of educational inquiry, designing and implementing studies that hold promise for investigating teaching as complex phenomena is more critical than ever. I contend that

non-linear conceptual and methodological frameworks, such as rhizomatics and situated analysis, move beyond "outcomes" and into the actual ontology of practice, turning attention to the processes that constitute teaching. For example, a rhizomatics framework offers concepts and language that create possibilities for *thinking differently* about teaching, emphasizing and highlighting the multiple, jointly constituted, ever-evolving nature of teaching. Using concepts like *assemblage, multiplicity, becoming,* and *line of flight* helps to move outside the normalized ways of analyzing and discussing teaching practice and promotes a shift toward more complex conceptualizations of enacting instruction.

Non-linear methodological approaches, such as rhizome mapping and situational analysis, offer possibilities for conducting analyses that attend to connections among multiple elements in a setting, including those that are non-human, as well as the processes that shape the production of social activity (in this case, teaching). Using these methods—and/or other non-linear, systems-level methods/approaches, such as Cultural-Historical Activity Theory (CHAT) and Actor-Network Theory—to conduct in-depth studies of teacher learning and practice can help provide critical resistance to both dominant research paradigms and programs that perpetuate an idea of teaching as executing a particular checklist of behaviors. By highlighting the ontology of learning and practice—in other words, the way these processes are carried out, the way they moves across time and space into new teachers' classrooms—researchers can make a critical contribution to the research community through documentation of the interactional, relational nature of teaching. Much of the research in the field of teacher

education attends to static constructs (or constructs being treated as static), such as teacher beliefs and characteristics. To move the field forward, an *ontological turn* (Lather & St. Pierre, 2013) in teacher education research is needed, one specifically focusing on "how" questions and inquiries into the process of teaching.

In studying teaching as non-linear phenomena, open-ended research frameworks are also needed that can account for the phenomenon of *emergence*, or *becomings*—occurrences that are entirely new, and could not have been predicted from initial conditions. Computer simulations can generate twenty-five possible scenarios of teaching activity based on interacting elements (Opfer, 2013), but what if the practices produced morph into something that is as yet unknown? The education community needs more studies using rich, qualitative frameworks that can produce both thick descriptions (Geertz, 1973) and thick analysis (Clarke, 2003) showing the ongoing, dynamic, always-becoming nature of teaching at the classroom level. Specifically, studies that investigate interactions between teachers and students, and the ways that multiple classroom-level elements shape teaching practice, are needed.

A Final Reflection

Making recommendations to employ research methods that can better attend to non-linear phenomena is relatively easy. However, actually carrying them out in systematic ways that contribute positively to the research community is a much more difficult undertaking. My own journey in conducting this dissertation study and reporting data reflects the struggle of producing text for the reader that, while able to convey the main ideas of the study in an understandable and compelling way, also portrays the

messiness of multiple, entangled, simultaneously occurring processes that constitute the construction of practice. Although my aim was to create case studies that conveyed the non-linearity of constructing teaching practice in form and theory, the actual product became fairly linear in its organization—in rhizomatic terms, a tracing (Deleuze & Guattari, 1987). According to Deleuze and Guattari (Ibid), a rhizome is a *map*, and the representation of the map is a *tracing*. A tracing is a static, flat reproduction of reality, while a map is open and connectable, with multiple entryways.

My struggle to create a map, and not a tracing, partially reflects the common qualitative research problem of the "crisis of representation" (Denzin & Lincoln, 2005, p. 3), or the struggle to report lived experience in ways that do justice to the richness and complexity of the moments of our everyday existence, which Deleuze would call "haeccity" (i.e., "this-ness") (Deleuze & Guattari, 1987; St. Pierre, 2004). Yet the tensions existing in this study between linear structure and non-linear thought also speaks to my own internal molecular struggles to navigate the molar lines of academia, partly wanting to embrace different ways of thinking about and doing research on teaching, but yet not wanting to stray too far from the mainstream for fear that my voice would not be heard or valued by the larger research community.

The latter conflict speaks to a major, current tension in the field of qualitative educational research (St. Pierre, 2006; Lather 2006; St. Pierre, 2011)—the question of legitimacy of post-qualitative research in an era of positivist resurgence. Is it possible to produce truly different ways of thinking and doing research which reach beyond the margins of academia during a time when positivist, experimental research has resurfaced

as the "gold standard" of scientific inquiry? Perhaps, as Ellingson (2009) suggests, a way to pursue such a goal in the face of traditional academic confines, such as particular publication formats or standard dissertation conventions, is to pursue "guerilla" tactics of scholarship. That is, one might find ways to subtly weave small tendrils of theory or methodology that pushes traditional boundaries into a more standard research format, rather than using forms of data representation that are very different from those found in more mainstream research studies, to reach a wider audience (one that might reject the work in a more radical form). Although some scholars might criticize this move, I agree with Ellingson when she asserts:

> If you feel as passionately as I do that your work holds the potential to help people, to promote social justice, to shed some light on a complex problem, and/or to significantly influence your discipline, then make sure your important work that most directly serves those goals gets done and published. If that goal requires an adapting to a format you do not particularly enjoy, so be it…if subterfuge is required to effect change, then do it. Do not fear that you sell your soul; instead, embrace your righteous guerilla persona and infiltrate mainstream publication outlets. (134-135)

My nod to guerilla scholarship has been to cite works that follow non-traditional methodological and ideological paths throughout this study, as well as include a creative representation of data, narrative vignettes of instruction, in the appendices. To push the metaphorical envelope further, one might pursue other, more creative ways of blending non-linear and traditional methods. For example, a dissertation published online might

contain hyperlinks that when clicked, take a reader to another, connected piece of the dissertation, so that she might forge her own path based on her own interest or fancy. Perhaps, taking the idea of non-linearity even further, the structure of the traditional dissertation itself might be rearranged so that pieces are detachable, chapters might be perused in any order, and thus would be responsive to the needs of the reader (as Deleuze and Guattari's *A Thousand Plateaus* itself was meant to be read).

Although my overall product may be more linear than I might have hoped it would be when I began to work on the dissertation, I believe that some of the ideas introduced do represent a departure from mainstream understandings of teaching practice in the field of teacher education/research. In this way, the Deleuzian frame has helped me make sense of my own research journey and bring a productive lens recognizing my own lines of flight, or escapes from the status quo. These small interruptions—such as presenting the work of the teacher as jointly constituted by the interaction of multiple classroom and school setting factors—might be seen as breaking free from the mainstream of thought in teacher education, only to be recaptured again. Yet, in their re-entry, these lines of flight shuffle the system as a whole, producing change—perhaps infinitesimal—but unpredictable in its eventual influence. Perhaps, as Deleuze and Guattari (1987) suggest, these "micro-transformations" are the key to moving the field of teacher education toward a more complex, multiplistic conceptualization of constructing and enacting teaching practice. Further, adopting a perspective that emphasizes finding the breaks from the status quo presents a forward looking, positive view of activity that focuses on production rather than lack. This type of perspective, for example, allowed me

to find affirmation even in my own critical reflection of my work.

In the current era, with educational disparities larger than ever and systematic attacks taking aim at both public education and teacher education, the fight for equitable education in our schools may seem an impossible uphill battle. Rhizomatics offers a compelling theory of moment-to-moment social change that provides a hopeful lens for those involved in the struggle for a more just society in education. A rhizomatic perspective offers not only a mutiplistic view of teaching that provides an "antidote" to more linear ways of viewing educational activity, but also suggests an alternative way of conceptualizing the seemingly sisyphean task of education reform—one that might potentially disrupt the disillusionment even the most committed educators and researchers face in light of current struggles in schools. According to a rhizomatic view, our existence is overcoded. Molar lines that we must navigate are a given. Yet, every day provides opportunity to break from the status quo and follow a line of flight, whether in K-12 classrooms, on university campuses, in research projects, or in the course of daily life. Although always recaptured by the ever-present dominant forces in society and institutions, when continually re-created over time, these small escapes can build to greater transformation in education and society as a whole.

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Appendix A: Detailed Lists of Lessons Observed

A-1. Mauro Lessons

Class	Grade/ Subject	Topic	Lesson components
1	9, Environmental	Objectivity in Scientific Processes	1. Do-now: Identify steps to make peanut butter and jelly sandwich 2. Teacher-led demonstration with student input: identifying the steps to make a peanut butter and jelly sandwich 3. Small group activity: Create a design using different shapes and record each step in the design process. 4. Small group activity: Using only the recorded steps, create another group's design. 5. Whole-class discussion: identification of quality procedures 6. Notes: Objectivity and Subjectivity
2	11, Earth	Density and Earthquakes	1. Do-now: Review of P-waves from previous class 2. Class discussion of the do-now 3. Small group activity: Theorizing the atomic structure of a stack of books 4. Discussion of small group activity and introduction of major concept, "density" 5. Demonstration with student volunteers to illustrate the concept of density 6. Paired activity: Predicting what will happen when a car crosses from mud to cement 7. Demonstration with student volunteers to simulate car wheels hitting cement and skidding 8. Exit card: connecting concepts of density and earthquakes
3	11, Earth	Theory of Continental Drift	1. Do-now: Theorize how the continents got their shape 2. Discussion of do-now 3. Video on Wegner's theory of Continental Drift with accompanying questions 4. Whole-class discussion of questions 5. Notes: 2 pieces of evidence for theory of continental drift

			6. Activity with manipulatives: Use the current shapes of the continents to put together Pangaea and draw conclusions based on fossil evidence. 7. Class discussion of activity and presentation of two more pieces of evidence for the theory 8. Exit card: Identifying the big idea of the lesson
4	11, Earth	Rock formation and Seafloor Spreading	1. Do-now: Where do rocks come from? 2. Discussion of do-now 3. Teacher-led demonstration: formation of salt crystals 4. Individual activity: transferring the process of the salt crystallization to rocks forming in oceans 5. Discussion of answers 6. Individual activity: theorizing seafloor spreading 7. Sharing and discussion of theories 8. Video about seafloor spreading with accompanying questions 9. Discussion of questions and answers 10. Individual activity: diagramming seafloor spreading and identifying movement 11. Discussion of diagrams, connection to continental drift 12. Individual activity: theorizing about the earth's magnetic field and metal in rocks 13. Teacher-led demonstration: interaction between metal shavings and a magnet 14. Discussion of demonstration 15. Exit Card: Read passage on "Paleomagnetism" and answer two questions.
5	11, Earth	Calculation of Seafloor Spreading Using Map Data	1. Do-now: Review of seafloor spreading 2. Discussion of process of seafloor spreading 3. Notes 4. Teacher-led review of mathematic proportions 5. Individual activity: calculating map distance using scales

			6. Discussion of problem and solution 7. Individual Activity: Differentiated worksheet; one side with practice problems, one side calculating distance using maps
6	11, Earth	Plate Tectonics	1. Do-now: Why do maps have scales? 2. Discussion of do-now 3. Individual Activity: theorizing what happens to rocks as they spread 4. Individual or group activity: Set of questions that students use the book to find, which help them answer a “big idea” question about plate tectonics 5. Exit card: How does plate tectonics relate to the fact that the continents move?
7	11, Earth	Review	1. Do-now: Review of plate tectonics 2. Group activity: Complete a review worksheet using notes and the textbook.
8	9, Environmental	Theory of Evolution	1. Do-now: Write down the characteristics that you think helps a chameleon when it hunts. 2. Discussion of do-now accompanied by graphics and video clips of the features of a chameleon 3. Notes with discussion of variation and natural selection 4. Video on evolution with accompanying questions 5. Discussion of questions and answers
9	9, Environmental	Adaptation	1. Do-now: Review of natural selection 2. Discussion/review of natural selection 3. Individual activity: Create questions about animal survival 4. Individual Activity: identifying the function of specific animal adaptations 5. Whole-class activity: Shared reading 6. Class discussion, shared example of identifying adaptations and their functions from the text 7. Individual or paired activity: identifying adaptations and their functions from the passage

			8. Sharing of answers 9. Individual or paired activity: identifying adaptations and their functions from another passage in the textbook 10. Exit card: Compare and contrast evolution and adaption.
10	9, Environmental	Interactions and Relationships	1. Do-now: Describe how and where you fit in in your community. 2. Discussion of do-now, connection to "niches" 3. Whole-class activity: Using a graphic organizer, students write definition of 5 interactions and assign an emoticon (smiley, sad, or straight face) to each party to indicate the nature of the relationship. 4. Whole class activity: Using the same graphic organizer, students watch a series of five videos and determine which interaction is being shown. 5. Group activity: Students read a series of vignettes about animal interactions, identifying each interaction
11	9, Environmental	Biodiversity	1. Do-now: Which kingdom of life is most important in determining how many species live in an area? 2. Discussion of do-now 3. Notes on biodiversity 4. Individual theorizing: why is biodiversity important? 5. Discussion of the importance of biodiversity 6. Notes 7. Discussion of definitions: keystone species, species/population survival, medicine and food.

A-2. Bruce Lessons

Class	Topic	Lesson Components
1	The experimental process; precision and accuracy	1. Demonstration: Bruce leads the students through an exercise designed to demonstrate the reasons scientists create procedures for experiments. 2. Demonstration: With volunteers, Bruce uses Nerf guns to demonstrate the difference between precision and accuracy. 3. Class discussion of the concepts of precision and accuracy. 4. Review of class objectives.
2	Kinematics, Ballistics	1. Demonstration: Students observe what happens when Bruce fires a Nerf ball launcher vertically, then horizontally. 2. Notes regarding ballistics, vertical and horizonal kinematics formulas 3. Demonstration with student volunteers: Bruce and two students fire a ball launcher and taking measurements. 4. Whole class problem solving: with student input, Bruce plugs the measurements into the formula. He invites students to the board to solve.
3	Kinematics	1. Notes: Kinematics formula review. 2. Quiz on kinematics.
4	Kinematics	1. Quiz on kinematics. (Bruce had planned to teach a lesson introducing Newtons 3 laws, but students cheated on their quiz with a substitute the day before and he was re-administering it).
5	Newton's Three Laws of Motion	1. Video: Introduction to Newton's Laws 2. Notes: Newton's first law. 3. Demonstration: Newton's first law. 4. Notes: Newton's second law. 5. Demonstration: Newton's third law.
6	Newton's Second Law	1. Worksheet of problems
7	Force, Mass, and Acceleration	1. Do Now: Three homework problems are on the board. Bruce asks for student volunteers to solve them. 2. Share out. 3. Collaborative activity: in groups of 3, students are given a variable (force, mass, or

		acceleration) and they have to create a “hard” word problem with it. 4. Game: Groups present their word problems and the other teams have 2 minutes to solve them.
8	Free Body Diagrams	1. Quiz on Newton’s laws. 2. Demonstration: Bruce and a student volunteer push a cart in different directions, demonstrating force direction. 3. Notes- Free Body Diagrams and visually showing forces acting on objects. 4. Whole class problem solving: Bruce asks for students to help him solve two examples of Free Body Diagrams.
9	Free Body Diagrams; forces	1. Do-Now: Warm-up problem, Free Body Diagram. 2. Share out/student demonstration: Bruce asks for a student to volunteer to solve and explain the problem. A student draws her solution on the board with coaching. 3. Notes: Different types of forces appearing on Free Body Diagrams. 4. Example Problem: With input from students, Bruce solves an example problem. 5. Collaborative activity: in pairs, students create a scenario and an accompanying free body diagram.
10	Free Body Diagrams; magnitudes	1. Do-Now: Draw a Free-Body Diagram that shows all forces applied to a block, comparing magnitudes (accompanied by a physical block resting on a cart). 2. Notes/discussion: Bruce solves the problem with some input from the class and discusses magnitude and friction. 3. Demonstration: Bruce moves a chair across the floor, explaining friction and constant velocity.
11	Free Body Diagrams; Tension	1. Do Now: Students solve a free body diagram with an actual force value (a new idea). 2. Student demonstration: two students solve the do-now problem, explaining their process to the class. 3. Discussion: Bruce discusses recent physics news with the students (water/ice was found

		on Mercury). 4. Notes: Tension 5. Demonstration: Bruce demonstrates tension by asking a student to pull on a towel. 6. Whole-class problem solving: Bruce solves an example problem with tension, with class input.
12	Measuring Force	1. Do Now: warm-up problem 2. Review: direct and indirect measurement 3. Group activity: creating procedures for a dart-gun lab to measure force
13	Measuring force	1. Do now: Finish creating experiment procedures. 2. Group activity: students perform 3 trials, firing a dart gun and taking measurements to find the force with which the dart gun shoots.
14	Gravity	1. Group project: Students work in groups of 3-4 to build sustainable space stations, including designing a source of artificial gravity.
15	Gravity	1. Group project: Students work in groups of 3-4 to build sustainable space stations, including designing a source of artificial gravity.
16	Gravity	1. Group project: Students present their space station model, explaining their overall design and discussing their source of artificial gravity.

A-3. June Lessons

Class	Topic	Lesson Components
1	Making observations, learning “subjective” and “objective”	1. Small group activity: making observations of materials and creating questions 2. Notes and discussion: Acids, bases, neutrals 3. Lab: Testing ph strips to find acidity. Students predict acidity of liquids based on prior knowledge, and then test their hypotheses using ph strips.
2	Review of Scientific Method	1. Do Now: Review of scientific method 2. Notes and Discussion: Steps of the scientific method 3. Lab: Measuring heart rate. Students measure their resting heart rate, perform exercises, and measure their heart rate after the exercise.
3	Scientific Method Assessment; water molecules	1. Assessment: Students rotate between 5 stations with performance-based tasks regarding the scientific method. 2. Lab: M&Ms experiment. Students observe and theorize about what happens to M&Ms when they are submerged in water.
4	Water molecules	1. Do Now: Students theorize about properties of water using previous knowledge. 2. Lab: M& Ms experiment. (Note: this class is a bit behind, so I saw a repeat of the previous lesson).
5	Water molecules, polarity, cohesion and adhesion	1. Do Now: Writing explanations for the M&M lab based on homework. 2. Video: polarity, adhesion and cohesion 3. Lab: Students use a dropper to try to fit as many drops of water on the head of a penny as possible, then follow this by dipping the penny in dish soap and repeating the experiment.
6	Biochemistry, surface tension	1. Do Now: Review of polarity 2. Notes and Discussion: Venn Diagram of adhesion and cohesion. 3. Pepper demonstration: June demonstrates surface tension and bond breaking by covering the surface of water with a coat of

		pepper, having a student dip a finger in dish soap, and sticking their finger in the water (the pepper spreads out when the soap comes into contact).
7	Criterion Referenced Test; introduction to atoms	1. Criterion Referenced Test 2. Reproduction of pepper demonstration for absent students 3. Shared reading: Atoms
8	Graphing data from Superstorm Sandy	1. Whole class inquiry and graphing exercise: "Analyze the statistics of people who were without power during Superstorm Sandy."
9	Graphing data from Superstorm Sandy	1. Whole class inquiry and graphing exercise: Continuation from the previous day.
10	Atoms and the periodic table	1. Do Now: How many times can you tear a piece of aluminum foil? 2. Shared Reading: Atoms 3. Guided Notes: Atoms and the periodic table 4. Individual activity: Constructing the atomic makeup of elements using m&ms.
11	Chemistry of water	1. Station activity: Students complete five activities at stations around the room. Each station requires an application of knowledge of chemistry of water (polarity, solutions, adhesion, cohesion, and surface tension) and atomic structure (subatomic particles, isotopes, ions, and bonds). 2. Whole class discussion of station activities and review
12	Macromoecules	1. Do now: Using two visuals, students must use their prior knowledge to hypothesize which is a polymer and which is a monomer. 2. Share out of do-now and discussion of polymers and monomers 3. Paired activity: Using readings provided by the teacher, students investigate 2 of 4 types of macromolecules (Carbohydrates, lipids, proteins, nucleic acids) and prepare a presentation to teach the other group.
13	Chemical reactions and enzymes	1. Do Now: Vocabulary quiz. 2. Share-out of do-now and review of macromolecule concepts covered previously 3. Shared reading: June and students take turns

		reading about reactions and enzyme catalysts while students complete an accompanying graphic organizer. Student volunteers also write important information on the board. 4. Toothpickase group activity: In groups of 2 and 3, Students act as “enzymes” and time themselves breaking 30 toothpicks to demonstrate that more enzymes=faster reactions.

Appendix B: Interview Protocols

B-1. Interview Protocol 1

1. Can you describe why you wanted to become an urban science teacher?

2. What do you think is the best way to teach your subject? How do you think that will impact your own teaching this year?

3. How do you think the students you have in your class will affect how you teach?

4. What role do you think collaboration will play in your teaching? What about professional learning?

5. How do you think your learning and experiences from your program last year will play a part in your teaching? What about your duties outside the classroom?

6. What are your expectations for the induction program this year? How do you think your experiences might affect your teaching?

7. What are some things that you think might influence your teaching this year, and how? In terms of the school, your co-workers, the principal, anything else?

B-2. Interview Protocol 2

1. Now that you've been in the classroom for a couple of months, how would you describe your teaching style? What would a typical lesson look like in your classroom?

2. When you are planning a lesson, what are some things that might influence how you structure a lesson?

3. How do your students influence what and how you teach (if at all)?

4. Can you describe your experiences so far with collaboration with colleagues? What about professional learning? Has that affected your teaching in any way?

5. Do you see your learning and experiences from your program last year playing a role in your teaching now? If so, how? What about outside the classroom, in terms of your relationships with colleagues, taking part in professional development, or anything else related to professional duties?

6. Has your experience with the induction program impacted your teaching? If so, how?

7. Are there any other classrooms or school influences that you think play a part in your teaching? If so, what are they and how do they affect you?

B-3. Observational Debrief Protocol

1. Can you walk me through your instructional choices for this lesson and why you chose to use these particular methods/strategies?

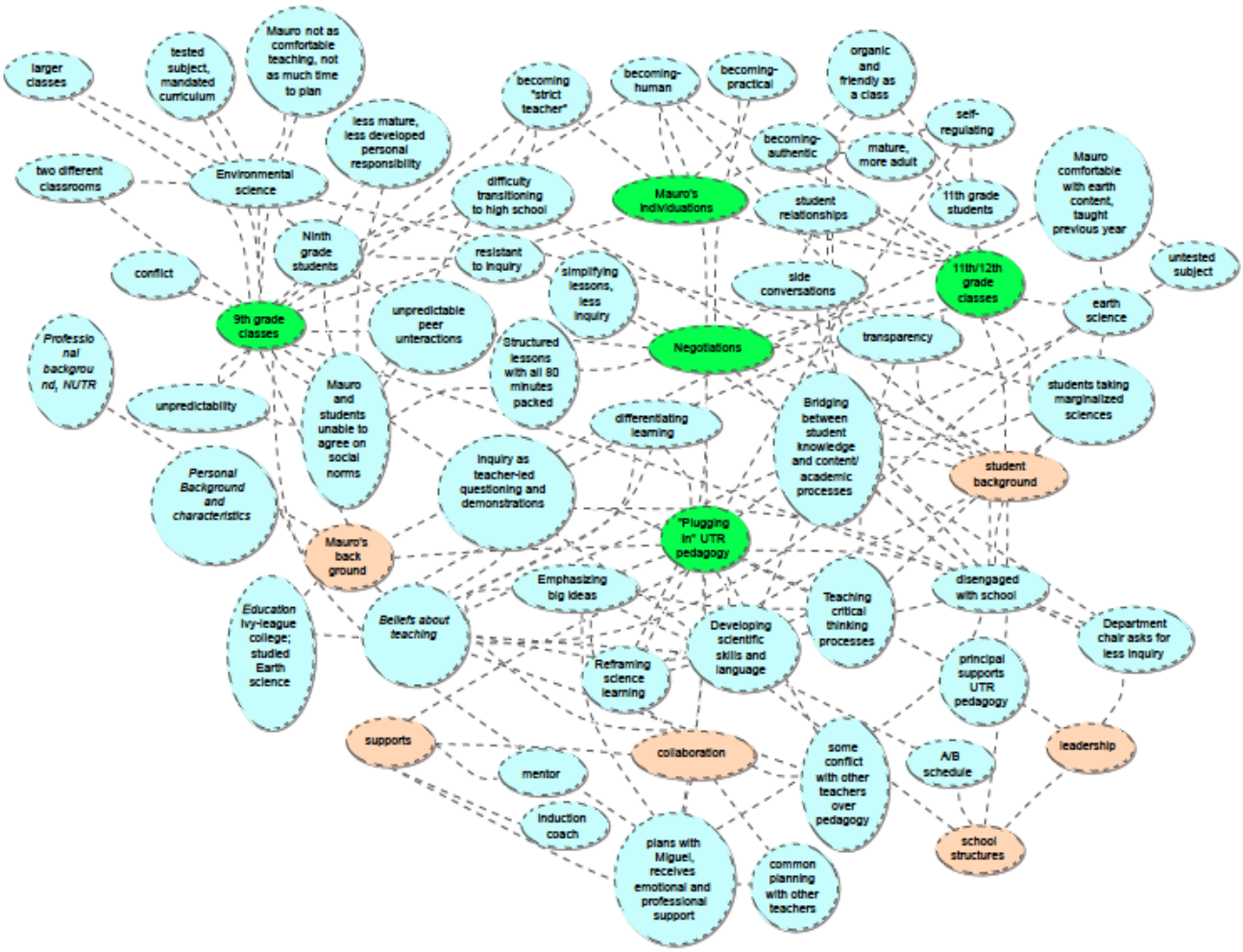
2. How do you think this lesson and the methods you used connect to your learning or experiences from your teacher education program? What about the induction program you are taking part in now?

3. Did you depart from your lesson plan or modify your instruction in any way? If so, why?

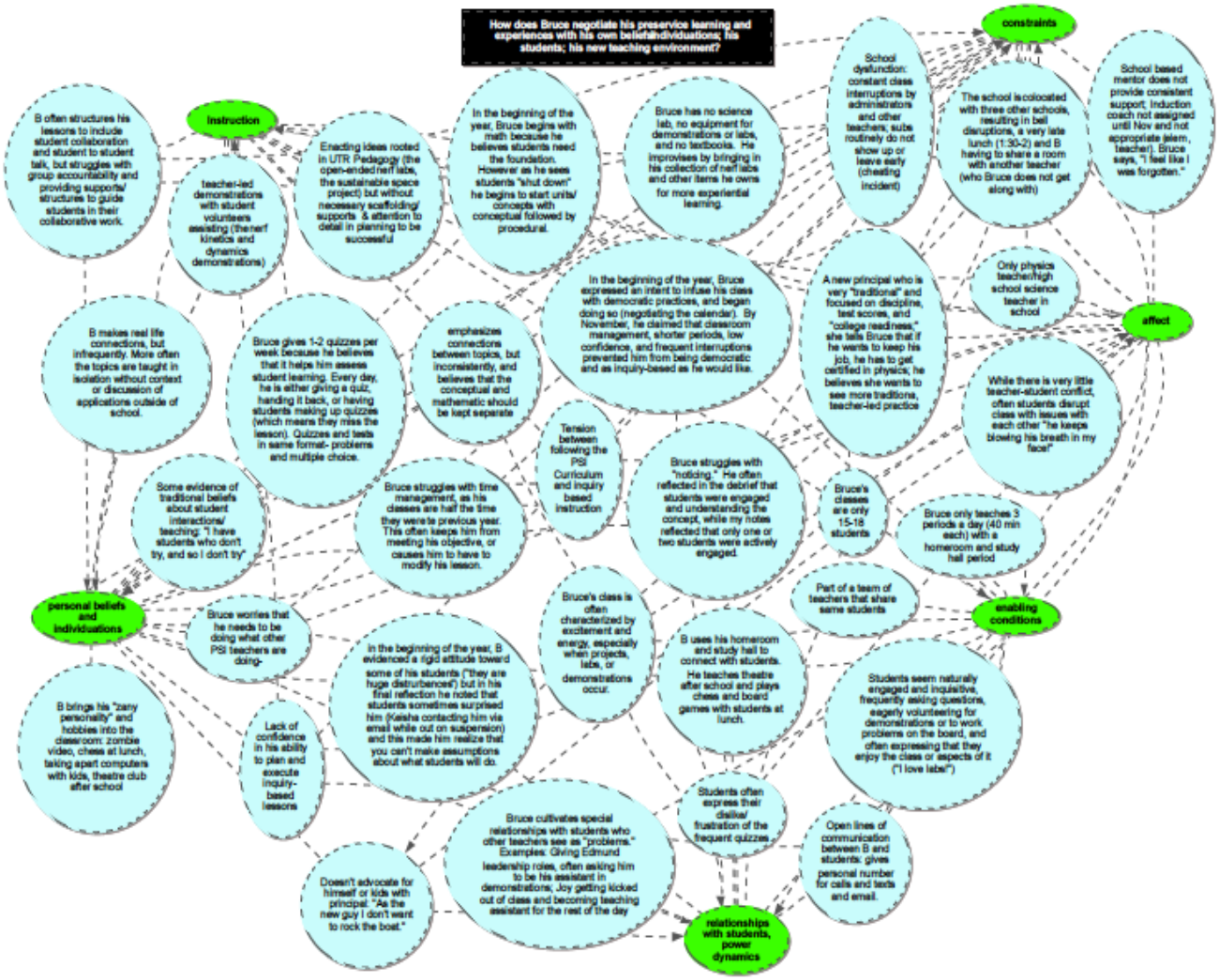
4. What did you want your students to take away from this class? Do you feel like they learned what you wanted them to learn? How do you know?

Appendix C: Examples of Rhizomatic Maps

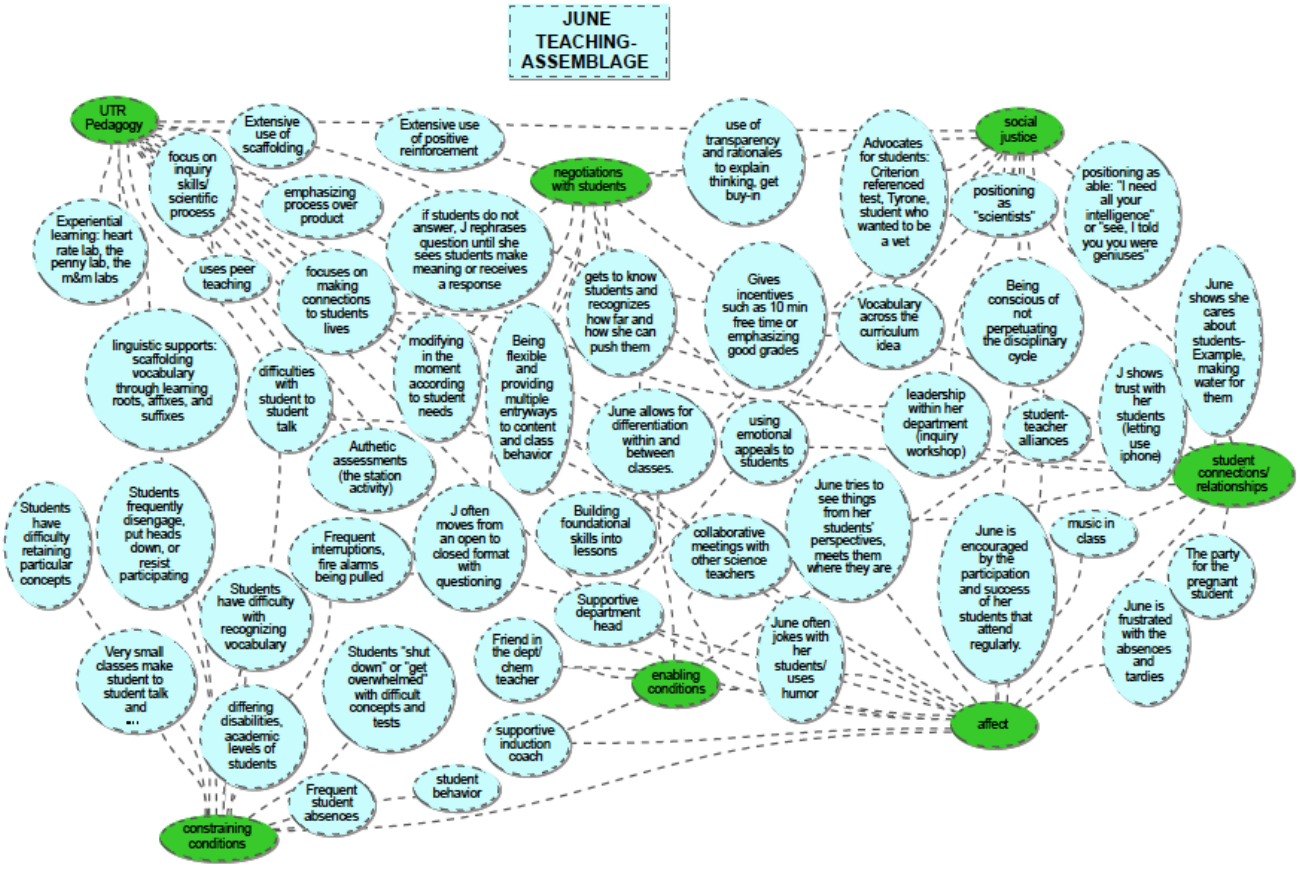
C-1. Mauro Rhizomatic Map



C-2. Bruce Rhizomatic Map



C-3. June Rhizomatic Map



Appendix D: Situational Analysis Maps

D-1. Mauro Situational Analysis

"Who and What are in the Situation?"

People	Mauro; his students; his mentor; other teachers in the dept; his induction coach; his department chair	
Setting	Lincoln High school; two classrooms	
Enabling conditions	**Elements Mauro brought** • Creativity, flexibility, comfort with ambiguity • Familiarity with school, dept, teachers, students in 11th grade, content area • Deep subject knowledge • Awareness of social justice issues in school	**Elements in the environment** • 80 minute blocks • Miguel • Other teachers from the residency • General commitment to principles of the residency pedagogy • Mentor
Constraining conditions	• Mauro's hypercriticality	**Elements in the environment** • A/B schedule • Lower track classes/devalued sciences • 2 different preparations, one of which was a new subject • Difficulties collaborating with other teachers due to time/scheduling • Mandated common planning/assessments • Data-driven focus adds burden • Resistance from 9th graders to inquiry, active learning, M's relational style • Testing and curriculum pacing for environmental constrains planning • Student absences and tardiness • Student confidence/lack of confidence in reading and math • Having to teach in 2 classrooms

Pedagogy	• Inquiry as teacher-led questioning and demonstrations • Teaching critical thinking processes • Emphasizing big ideas • Reframing science learning • Bridging between student knowledge and content/academic processes, making learning relevant • Developing scientific skills and language
Dilemmas/ Problems of practice	• Personal feelings of being overwhelmed/inadequate • Lack of time to complete lesson plans/responsibilities • Transitioning from two people in a classroom to one; being able to reach all students • Differentiating appropriately for a class that has a huge variation in skill level; but not assigning busy work for those who finish early • Understanding where students are, not making assumptions about their skills • Student resistance to inquiry/active learning • Student resistance to management style/student behavior • Student resistance to reading, writing, mathematics • Helping students build skills of self regulation in the classroom • Difficulties implementing student to student discourse • Getting to know 120 students, their backgrounds, and their needs • Student disengagement with school, school structures

"What are the Social Negotiations in the Situation?"

Assemblage Element	**Micro Analysis of element**	**Connection to Assemblage Function**
Mauro	*Personal Background and characteristics* From non-mainstream background: First generation, working class family, non-English speaking home as a child *Education* Ivy-league college; studied Earth science *Professional background* -Urban teacher residency learning	**Pedagogy:** Pedagogy informed by UTR background (UBD, inquiry, student-centered classrooms); his own beliefs; his background in inclusion in the same school **11th grade assemblage:** Mauro's previous experience the year before teaching this course, as well as content area expertise, contributed to the more productive functioning of

	emphasizing inquiry, social justice -One year internship in same school yielding familiarity with school structures, people and background in inclusion *Beliefs about teaching* -Questioning is the best way to teach -his role should be to teach thinking -teachers are "human" -Best teaching is one on one and small group Teachers should get to know students/their backgrounds	the assemblage **9th grade assemblage:** That this was the first time he was teaching; was committed to inquiry and teaching thinking; and had particular social expectations of students contributed to conflict/less productive functioning. **Supports:** Mauro's mentor helped him enact the day to day lessons; the induction coach helped him navigate bureaucracy; Miguel helped him reflect/plan and gave emotional support/encouragement. **School site elements:**
Pedagogy	Inquiry as teacher-led questioning and demonstrations Teaching critical thinking processes Emphasizing big ideas Reframing science learning Bridging between student knowledge and content/academic processes Developing scientific skills and language	Mauro: Pedagogy informed by UTR background (UBD, inquiry, student-centered classrooms); his own beliefs; his background in inclusion in the same school 11th grade: Pedagogy informed by M's comfort with content, freedom, experience teaching the class; social dynamics, attitudes of students, willingness of students to engage in inquiry, thinking 9th grade: pedagogy informed by Mauro's own beliefs about teaching, being less comfortable with the challenges negotiating social norms with ninth graders; ninth graders' resistance to active learning and social

		dynamics; large classes; and other constraining conditions (being a tested subject=less freedom in planning, more pressure to achieve particular objectives on a particular schedule). Supports: His mentor helped him think through “day to day” processes and provided emotional support. School site: Was confident using inquiry-based approach because NUTR program was at school site, had support of principal, and had several cohort members in department
11th grade assemblage	*Content: Earth Science* Mauro had experience from previous year; in charge of common planning; more freedom, an untested subject *Pedagogy:* Classes feature frequent theorizing, demonstrations, differentiated group activities *Social Dynamics:* Mauro and students had agreement that students could chat as long as they got their work done; atmosphere very casual, lots of humor *Teacher Individuations:* Mauro was happier with these classes, more casual, more "himself." *Students:* Lower tracked students Mauro thought that they were mature, had more mature life experiences, were more open to inquiry and critical	His previous experience and comfort with the content, as well as the freedom and in being in charge of common planning, were enabling factors in enacting inquiry-based practice. Combined with the mainly harmonious social interactions and the student characteristics, as well as student willingness to engage in Mauro’s planned activities, these conditions contributed to construction of practice rich in inquiry, theorizing, and collaborative learning. These conditions also contributed to Mauro feeling like he could be more relaxed and authentic, and he was happier with these classes.

	thinking	
9th grade assemblage	*Content: Environmental Science* Mauro's first time teaching the subject. Did not have common planning with other environmental teachers, some conflict with common planning. Tested subject with curriculum sequencing from district. *Pedagogy:* Mainly teacher-directed, but interactive notes and presentations. Occasional individual or group activities. *Social Dynamics:* Disconnect between Mauro's expectations and student social norms contributing to negative affects/irregular functioning. *Teacher Individuations:* Mauro became a more rigid teacher, which led to more social conflict. His affective becomings- becoming depressed, exhausted, disappointed, angry. *Students:* Lower track students, first time in high school Mauro thought the students were "overwhelmed" with the transition from middle school. He felt they were resistant to inquiry and critical thinking, and lacked understanding of appropriate social norms for the classroom.	Multiple constraining factors—Mauro being less comfortable, having less freedom and more pressure as a tested subject; not able to negotiate satisfactory social norms; unpredictable cooperation/some resistance from students in terms of learning activities; and unpredictable social dynamics between students contributes to Mauro's adoption of more traditional, teacher-centered practices—though still with some creative elements—and Mauro's becoming more authoritarian.
Supports	*School-based mentor* *Induction coach* *Miguel, other teachers*	Mauro's mentor helped him 1) with day to day teaching and 2) providing perspective on first year teaching Mauro's induction coach was

		helpful in helping him navigate bureaucracy, prioritize responsibilities; but he thought she could have been more helpful with feedback. Miguel frequently collaborated with Mauro on planning; he shared the UTR background and a common vision of practice; served as emotional support, sounding board, providing encouragement.
School site ACTORS	*Principal- committed to inquiry, UTR program* - The principal did not have much day-to-day influence on M, but his support of inquiry-based approach may have added to Mauro's confidence in this type of teaching *DC- data driven, pedagogical mismatch* DC put "unnecessary burdens" on him, critiqued him for being "too friendly" *Other dept teachers* -Miguel: Collaborative, supportive -Environmental- "cliques"	That the school/principal was committed to the NUTR and had hired several NUTR teachers was a support in terms of Mauro's inquiry based teaching, as he knew others in the department/ school supported his style of teaching. His DC was a direct influence on his practice with the ninth graders, asking him to "pull back on inquiry," and caused personal stress in terms of data requirements. Planning with Miguel was an enabling condition, as they planned inquiry-based lessons together in their common content area, and discussed common challenges and solutions. Not having a common prep or sharing a common educational philosophy with the environmental science teachers was a constraint, as he sometimes had little say in the curriculum planning and assessments.

D-2. Bruce Situational Analysis

"Who and What are in the Situation?"

People	Bruce; Students; Mentor; Roommate Teacher; Induction coach; Principal(s)	
Setting	• Northeastern College Prep • Shared classroom • Room not set up for science class, no equipment, lab space	
Enabling conditions	**Elements Bruce brought** • Commitment • Coachability • Kids like him, find him interesting	**Elements in the environment** • Student enthusiasm • Only taught 3 classes, no more than 20 students • Lots of time to get to know students
Constraining conditions	**Elements Bruce brought** • Not reflective • Difficulty "noticing" • Molar lines within: constant testing, beliefs about separation of conceptual and procedural	**Elements in the environment** • Co-location with other schools • General school dysfunction=constant interruptions • Students are bussed in, can't stay after school • Student absences • Sharing room with Fr teacher • Student behavior • Mismatch in school culture, principal beliefs about pedagogy • Lack of support, feedback • Isolation- no other physics teachers
Pedagogy	• "Direct instruction with "breakout demonstrations" • Inquiry-based projects • Collaborative problem solving • Democratic methods	
Dilemmas/ Problems of practice	• Providing scaffolds for labs and assignments • Designing labs that are engaging and connected to content in meaningful ways • Conflict between management styles • Continuing to develop reflectiveness, noticing • Unpredictability	

"What are the Social Negotiations in the Situation?"

Classroom Element	Connection to Classroom function
Students, student relationships	• Students resist math; M brings in conceptual; Students disengage unpredictably during math portions. • Student enthusiasm • Student dynamics very unpredictable due to student-student conflicts=occasional interruption of lesson. • During active learning, demonstrations students very engaged, energetic, excited. • Some students seem very motivated and sometimes "take lesson into their own hands"
Bruce	His own ideas on teaching, orientations to teaching, personal capabilities influence practice: • Constant testing • Separation of conceptual/procedural • Lack of attention to scaffolds in planning • Worry about "other teachers", "out there" teaching, not wanting to stray from the norm Bruce's openness, commitment to student relationships helps foster open, comfortable environment
Principal, leadership change	• Change in leadership creates instability: the previous principal was on-board with inquiry methods, while the new principal focuses on discipline • B receives conflicting messages from the principal; mismatch in philosophy about management; creates worry, lack of confidence, struggle between more • Principal interrupts classes
School dysfunction	• Frequent interruptions put B behind, make it difficult to have cohesive classes • Lack of supplies, texts, equipment • Instability from leadership change • Lack of space/roommate teacher
Lack of support	• B felt "abandoned," forgotten; no one to reinforce NUTR pedagogy or help identify/ work through problems of practice
PSI Curriculum	• Math-based, B sees as very traditional • Creates tension because he feels he is expected to follow the PSI curriculum

D-3. June

"Who and what are in the situation?"

People	June; her department chair; Friend/colleagues; Induction coach; Students	
Setting	Washington High School Shared Classroom School environment has a reputation for being challenging	
Constraining factors	**Elements June Brought** • Lack of preparation for teaching special education students	**Elements in the Environment** • Absences, behavior • Student internalization of themselves as "disabled," "different," unable
Enabling factors	**Elements June Brought** • Commitment to social justice, inquiry-based pedagogy • Willing to take initiative, seek support	**Elements in the Environment** • Multiple Supports- supportive chair, department, induction coach • Small classes
Pedagogy	• Inquiry-based teaching, investigations • Linguistic supports, scientific literacy • Collaborative work • Authentic assessments • Relevant examples	
Dilemmas of practice	• Absent students • Student participation • Learning to be a special education teacher	
Discourses/ other	• School culture; reputation as a "bad" school • Discourse of disability—students' internalization of negative difference	

"What are the Social Negotiations in the Situation?"

Assemblage Element	Connection to assemblage function
June	• June's own commitment to inquiry, "buying into" NUTR pedagogy affects practices • June's content knowledge expertise (biology) • June's commitment to social justice helps build connections with students, advocate for students • June's willingness to take initiative complements supports already available in school environment, and willingness to take on leadership roles contributes to becoming an advocate within her dept. • Engages in intense negotiations with students for participation • June's own desire to be seen as a "calm authority figure" structures the ways she "allows" herself to interact with students- they call her "Ms. Calm"
June's students	• June's students are often resistant to participating in activities, creating challenge for carrying out student-centered activities • Frequent student absences complicate longer activities, make forming relationships difficult • Students are "special needs," meaning June has to accommodate them beyond the norm of the "autonomous learner" in varying ways • The needs and demeanor of each student vary widely, contributing to a need to differentiate curriculum, content, and methods both within and among her classes.
Pedagogy	• June's pedagogy is characterized by frequent labs and investigations and collaborative activities; her negotiations with students shape whether these are successful • June differentiates her lessons and builds in foundational skills/linguistic supports to help her students who are of varying skill levels; adopts multiple entryways for students who need to learn in different ways (e.g., R and letting him walk the room) • June tries to make connections to her students' previous experiences and knowledge within content • To help raise her students' confidence, June switches to using authentic assessments in a station-format.

Other school site actors	• June's department chair provides support, steps into mentor role, which helps June feel confident about her teaching, comfortable in taking leadership role • June's department is very collaborative and her colleagues are supportive, also contributing to confidence/comfort level • June's induction coach helps her with special education modifications, which helps her feel successful with her particular populations of students
Negotiations	• June constantly encourages her students, telling them how smart they are/how much she believes in them • Negotiates with positive incentives/external motivators—food, time to themselves, grades, positive calls to parents • Provides rationales and explanations to students for transparency • June builds relationships with students and learns to tailor her negotiations to each student, knowing what each responds to and how far she can push him/her

Appendix E: Instructional Vignettes

E-1. Instructional Vignettes for Mauro

Vignette 1: 11/12th grade Earth Science. *Mauro was conducting a short demonstration to give students a visual of crystallization, using a test tube of salt, boiling water, and a bucket of ice water. After using familiar scenarios (making coffee, jello) to elicit that salt would dissolve in "supersaturated solution" (hot water), he then told them he was going to submerge the test tube with the dissolved salt solution in cold water, and asked them to predict what would happen.*

Students offered several ideas: "It will explode!" "It will evaporate!" "It will turn hard!" Mauro placed the test tube in the water. "OK, let's see if it takes." As he waited, Mauro asked the class, "This is Epsom salt, has anyone ever worked with that?"

"Yeah," a student in the front said, "That's like, what you soak your feet in."

"What's the difference between Epsom salt and regular salt?" Another student asked.

"It's got bigger crystals," replied Mauro.

"And you can eat it!" said another student.

"Yeah," Mauro laughed as he pulled the test tube from the water, "It's good if you need to, uh, flush your body out."

"Gross!" groaned a student, as his meaning dawned on her.

Mauro walked around to each table, showing students that the solution was becoming cloudy and crystals of salt were starting to form. One girl exclaimed, "Whoa! It turned to ice! Oh, my god, Becky!" Mauro and several students around her laughed in reference to a line from an old hip-hop anthem.

"OK," Mauro said, returning to the front of the room. "So what did we end up seeing?"

Students yelled out their thoughts: "It's little balls of salt." "It's turning hard." "It's like a ball of ice."

Mauro retrieved a second test tube from his desk and held it up. "OK, so it was a liquid and now it's turning into a solid…over time it's going to look like this." He rotated between the tables so all the students could see that the test tube contained nothing but solid salt crystals.

After summarizing the process they had just witnessed, Mauro asked, "So what does this have to do with today? This is the same way that rocks form."

On the lefthand side of the board, Mauro wrote:

Supersaturated solution=

Ice water=

Salt Crystals=

On the righthand side, in line with the first column, he wrote,

Ocean water

Rocks

Lava with metals

"So here you've got your story about the hot water solution, your ice water, and your crystals. I'm saying that this story" --he gestured to the column on the right-- "is the same way that rocks form. So try to match up which of these"—pointing to the salt column—"matches up with these. So these are an analogy for these. Take thirty seconds

in your notebook." As students worked, Mauro circulated between the tables, checking work over students' shoulders.

"OK, who would like to pick one and match it up?"

"Ice water and ocean water," offered a student.

"OK, and why are you doing that?"

"Because they are both cold."

After eliciting answers for the other two, he summarized, "OK, so the story you could tell for the salt crystals, you could tell for the rocks here. So to give you a picture…" Mauro picked up a whiteboard marker and drew a picture of an underground volcano. "So here's our problem...lava keeps pushing up and rocks keep forming…so where are these rocks going? So take thirty seconds to get your thoughts down. So this lava keeps coming out and rocks are being made, so what is going to happen to the rocks over time? They have to go somewhere…where do they go? Write down what you think."

Some students began writing, but others either were still thinking about the problem, were having trouble coming up with something to write, or otherwise off-task (talking to their neighbor, playing with their cell phone or ipod, and so on). Mauro began to make his way around the room, stopping at two students who were chatting. Mauro squatted down and folded his arms atop their desk, resting his chin on his hands. "OK, gentlemen, what are you thinking?"

"It's building more rocks."

"Right, but where is it going to go?"

"The shore?"

Mauro turned and indicated the drawing on the board. "So here's our lava…this lava is going to keep pushing up more and more…there's so many rocks, it's like a crazy ice machine…what is going to happen to the rocks? Where will they go, where can they go?"

The student looked down at his paper. "I don't know, I don't know where they could go."

"Remember, this is deep in the ocean…where could it go?"

The student thought for a moment. "It would go above sea level?"

"So you are claiming they would rise?"

The student shook his head. "No, they would fall to the floor."

Mauro nodded toward the students' paper. "And then where would they go? Go ahead and get some thoughts down."

After a few more minutes of circulating, Mauro returned to the front of the room. "OK, let's bring it back…" Students were talking loudly by this point, and he had to repeat himself a few times. Mauro continued, "OK, a lot of you had interesting and well-thought out theories. Could anyone visually show what they think is going to happen on this map, on this picture?" He gestured to his drawing on the board. A girl got up, took the marker from him, and began to draw. "Does anyone else want to come up and draw beside her?" Mauro asked, quickly grabbing another marker and sketching a duplicate volcano on the other side of the board. Another student rose and walked to the board to draw as well.

"Dani, can you explain your drawing to the class?" He asked. The girl had drawn rocks overflowing from the volcano and creating piles. She explained that the rocks would pile up and become mountains. "Interesting," said Mauro. "Emilio, can you explain yours?"

The second student had drawn the volcano similarly overflowing, with rocks creating piles and spreading out. "I was thinking more like islands…but the rocks are going to sink."

"And where do they keep going?" Asked Mauro.

"It's moving," said the student.

"What is IT?"

"It's the water…I don't know how to explain."

"It's OK," said Mauro, "You are right, and now we are going to watch a video on this, and it will tell you. We are going to watch a little of Bill Nye, the science guy!" A student in the back sang loudly, "BILL NYE THE SCIENCE GUY!" Mauro picked up the eraser and said," I apologize, but I have to erase this"—indicating the student drawings—"because I need it to project the video."

Vignette 2: 9th Grade Environmental Science. *It was 9:49 on a Tuesday morning. In Mauro's classroom, the students were grouped at rectangular tables, sitting four and five to a table. Chatter filled the air as students passed a large, clear plastic tub filled with brightly wrapped candies of different varieties. Mauro had given directions for each student to take two pieces of candy while they worked on the "do-now," which asked students to identify the characteristics of a chameleon that they think might help*

him hunt for food. When the bucket made its way back to the front of the room, Mauro looked at it, and stopped the class, saying, "Hold on, I would like to make an announcement." When students continued to talk, he reached over and turned off the power on the smartboard. "OK, I'm waiting…." He glanced over at the table of students to his left, still talking. "Ladies, I need to make an announcement." They turn toward him and stop talking, but another burst of laughter emanated from a table on the other side of the room. "I'm still waiting," Mauro said. Finally, he told the class why he had stopped: "The candy was supposed to be for part of the lesson. There were more than 80 pieces in this bucket, and if each of you took two, there would still be over half of the candy left." He held up the bucket so everyone could see that there were only a few pieces left at the bottom. "This was meant to be for teaching today, but now you have destroyed this teaching moment. Many of you took more than two. I'm not asking who did it, because I can't take it back now. But I just want to put it out there that by taking more candy than you were supposed to, now our lesson is going to be affected."

"You should know better than to trust us," a student said.

"I want *to trust you. OK, let's move on." With that, Mauro refocused on the "do-now," soliciting students to share their thoughts. "OK, I'd like to get people's thoughts…what helps the chameleon to hunt?" Several students raised their hands, but others continued to talk with their table-mates. M began to circulate the room, talking with students at individual tables and asking them to give their attention to the task at hand. After a few minutes of discussion, led by Mauro, about the camouflage and turret eyes of the chameleon, the volume in the room rose as students began talking again.*

Mauro stilled at the front of the room, crossing his arms over his chest. As students saw that he had paused, some called out, "Shhhhh!" M told the class at large, "I'm waiting." As students continued to talk, he repeated himself a few times: "I'm still waiting…still waiting."

One student huffed, "The silent treatment. I hate the silent treatment!" Another student from the back commented, "I think maybe if you just told us to be quiet, maybe we would." Mauro did not reply to these comments, but continued to wait. "OK, can we move on now? I want to see what's next," yelled out a student. Mauro paused for another moment more, and then clicked through to the next slide, which provided information about the long tongue of the chameleon, which was used to catch prey.

As the lesson progressed, several times Mauro stopped the lesson to wait and gather the attention of the students. Sometimes he would request, "Let's hold off on the conversations," before announcing, "I'm waiting." With each subsequent pause, some of the students became more and more aggravated, and the pauses became longer as students continued to disregard Mauro's waiting strategy. About twenty minutes before the end of class, Mauro once again paused and told the class, "I said this before, I'm not going to start until it is quiet."

The student, Michelle, who had made several caustic remarks about the "silent treatment," burst out, "The silent treatment is mad immature, yo."

Mauro replied, "It beats yelling at all of you. It-"

Michelle interrupted, "It's so immature."

Other students began to talk, some agreeing with her. " Can I finish?" Mauro asked. "Just let me finish my thought, and then we can hear from other people. I've told you that I don't want to yell, and at this point, if I did, I would lose my voice."

Michelle shot back, "If you wanted a job where kids will be quiet when you give them the silent treatment, you should have taken a kindergarten job. This is high school. If you don't tell us to be quiet, tell us to shut up, we aren't going to listen. You are the teacher last time I checked. If you don't act a little tougher people aren't going to listen to you."

" It's not my business to tell you to shut up or be quiet. I want you to develop some self-awareness around when it's OK to talk and when it's not. If you can develop those skills, then we could have discussions, rather than me standing up here talking all the time."

Michelle said, "Well you can continue on with your silent treatment if you think you are actually getting somewhere. Who else thinks it doesn't work?" A smattering of hands rose. "I've got four, five, six people that agree with me. Even the new kid. First time in this class and he agrees with me."

Mauro crossed his hands over his chest. "All right, well you can think that if you want." He stood silently, gazing at the class.

Michelle burst out, "So you are going to still wait it out? You're not going to do something about it? What kind of teacher does that?"

Mauro said calmly, "Michelle, why don't you stay after class for me."

"I gotta go to gym."

" I'll write you a pass."

"Fine. Whatever."

" I just want to help you all answer these questions…let's leave it at that."

Mauro picked up with the activity, continuing to discuss adaptation for the last few minutes of class. After the bell rang, Mauro called out for Michelle to stay behind and talk to him.

Michelle told him, "You have to be tough on us. The students see you as soft and weak. We talk before this class, we talk after this class, and we say how easy it is, and it's basically a free period. You need to step up, and maybe we can get our stuff done." Mauro explained, "It's not that I'm soft. I just don't think it's right for me to tell you to shut up. I choose this method because I want to help you learn to self-regulate."

E-2. Instructional Vignettes for Bruce

Vignette 1. Nerf demonstration. *The classroom echoed with a cacophony of excited teenage voices. Bruce walked into the classroom, signaling the start of class (the bells were synced to the elementary school, one of the three schools with which Northeastern College Prep was located). He crossed to the desk in the corner, where at least ten nerf guns—plastic toy weaponry that shoot soft Styrofoam-like projectiles—of differing sizes and design were laid out neatly in two rows, their brightly colored plastic vermilion and chartreuse exteriors a beacon in the artificial light of the classroom. The pitch grew higher as the students spied Bruce, in his uniform of khaki pants, a short-sleeved button-down oxford, and a multi-colored yarmulke perched on top of his head. One student yelled to the rest of the class, "Shut up! It's Nerf time!"*

"That's right," Bruce called out over the din. He chose two nerf guns and held one in each hand, pointing in different directions. Several students cheered loudly. "Right now," Bruce continued, "We are going to ponder a question not even Newton could figure out." He brandished the two weapons, showing students that the two Nerf guns he held were designed differently. "Which one shoots faster?"

The room filled with student voices, shouting their choice. "OK now- raise your hand- this one is mechanical"—he raised the gun in his right hand and about six students raised their hands—"and this one is automatic." The remainder of the hands in the class shot into the air. "OK, pass this over to Benjamin." He passed one of the guns to the student next to him, who dutifully, if regretfully, passed the gun to a tall, stocky African-American boy a few seats down. "Benjamin- take that and go towards the back." As

Benjamin took the gun and positioned himself in the back of the room, Bruce turned to the student on his other side and said, "Now just so you know- these are soft. They don't hurt when you shoot them." He shot the student in the arm, and an orange foam dart bounced off the boy's arm. The class broke into laughter. Bruce continued, "But still, no shooting in the face. OK, now how are we going to test this?"

"Shoot! Shoot him!" Several students called out. Bruce and Benjamin, who were positioned opposite each other, separated by the length of the room, fired, hitting each other with the foam darts. Benjamin's gun was an automatic and held several darts, while Bruce's gun was mechanical and only held one at a time. As the students observed the difference—Bruce was only able to fire once while Benjamin had the ability to fire multiple times—they called out, "No, you need to be on the same side of the room!" And another called out, "You should only shoot once!"

"Oh, okay," Bruce said, crossing over to the board and picking up a piece of chalk. "So we need to make sure we are each only shooting one bullet and we are shooting from the same side of the room." He wrote these on the board, numbering them "1" and "2". "Anything else we need to do?"

A girl toward the front suggested, "You should mark the floor where they stand." Bruce wrote this down as well. "OK, let's have another trial. Count off!"

The students in the class yelled out, "3…2…1…FIRE!" Benjamin fired and a moment later, Bruce fired his gun.

"Noooo!" cried the students.

"You have to fire at the same time!" a student cried.

"Oh, okay," said Bruce. He picked up the chalk again, wrote the third instruction, and continued, "So we gotta do this again!" The class groaned in response.

Bruce and the student aimed at the back board. The class once again counted down: "3…2…1…fire!!!" Once again Bruce and Benjamin each fired, but one of the darts did not discharge.

"Mr. C!" groaned one of the students. "Are you both using the same dart?"

"Hmmm," said Bruce, writing this new piece on the board. "We need the same kind of ammunition." He reloaded both guns. "OK…let's go again."

"3…2…1…FIRE!" Bruce and Benjamin fire again.

"Wait, who was watching to see where it landed? So we need someone to watch…so Curtis, go on to the back and see where it lands."

"3…2…1…FIRE!" They both fired. Curtis calls out, "It was Benjamin! It was Benjamin!"

"OK," said Bruce, "Now we are talking. So what did we learn from that?"

"You have to write down the instructions," offered one student.

Bruce nodded. "And how long did that take?"

"A long time!"

"We had to do that like seven or eight times!"

"Right." Bruce began to erase the board as he talked. "So just to summarize—when you do an experiment, the first time it's always going to go wrong, and you are going to have to go back and modify it, and then you record your modifications and the new outcomes." Bruce began to erase the board. "OK, now we are going to switch gears.

Malik, please draw a big bullseye on the board. We are going to discuss accuracy and precision. So if you are not sure what that is, we are going to see it right now."

Vignette 2: Collaborative Problem Solving. *Bruce entered the room and said, "Let's get started." He glanced toward the desks, which were situated in a "U" shape, where students were talking to each other. Skirting the edge of the U and narrowly avoiding colliding with a student dancing by himself, Bruce made his way to the board and began to erase. He continued, "If I can have everyone's attention…" A few students turned and faced the board, while others continued to socialize. Bruce raised his voice. "YO! I have something for us to do now!" As the talking faded, his voice returned to normal volume. "You remember the homework? Of course you do! Did everybody do it?"*

Several students called out at the same time. "I did it!" "I got my homework!"

Bruce picked up a piece of chalk and began to divide the board into three sections. "If course you did! I need volunteers to do number 10, 11, and 12." Hands shot into the air, and Bruce handed out pieces of chalk to students to work on the dynamics problems. "Go for it…ok, do we have someone for number 12?" They each approached the board and began copying their solutions onto the board.

Meanwhile, Bruce asked two students who had been absent the day before to move to a side table to make up a quiz they had missed. After giving them each a quiz and getting them started, he began to pass back quizzes from earlier in the week. As he made his way around to each student, the teacher next door, Ms. Birch, entered the room. "Mr. Cohen, we need you to go get your picture taken."

Bruce looked up in surprise. "I'm in the middle of teaching!"

"It will only take a minute. I will cover for you," replied Ms. Birch. Bruce nodded. "Keep working the problems," he said as he left the classroom. The students at the board, one by one, finished their problems and each took a seat. With no assignment, students talked to one another, a few yelling across the room.

After about five minutes, Bruce came back and thanked Ms. Birch for staying with his students. He quickly glanced at the board. "All right, did anyone get a different answer for number ten?" He glanced at the wall, seeing that more than ten minutes had already passed. "OK, is everyone ready to play the game? This game, we are going to up the stakes, this is actually worth extra credit points." He looked around at the students, who remained quiet. "What, you're not excited, I'm actually giving out extra credit points!"

As if on cue, students clapped, whistled, and some yelled "Yay!"

Bruce laughed. "OK, so I'm going to break you up into teams…"

"How many teams?" Asked a student.

"Last time we did six. So go ahead and separate the lab tables." Students obligingly began moving tables into groups. After they were settled, Bruce continued, "OK, so here are the rules of the game. I'm going to be giving you a paper with a variable on it. It's either going to be f, m, or a. You need to make a problem that other people will have a hard time solving. You can use kinematics equation one, two, or three to make this problem, or F=MA. And it's gotta be a word problem. I'm going to be putting the formulas on the board. Groups can be two or three people, but it can't be anyone who's taking a quiz currently."

Bruce retrieved a blue bucket from behind his desk. "All right, I'll go around, and let people pick their variable. The goal is to find the variable of your problem. You also have to be able to solve your own problem. So you will come up here--"he indicated the front of the room, "And read your problem. The rest of the class will have two minutes to solve it. If they can solve your question, they get a point. If you manage to stump the rest of the class, and still have a legitimate question, you get a point. So you want to make these problems as hard as possible, but still solvable. Get me?" He glanced around the room. "Everybody gets me? All right."

Bruce began rotating between groups, with students reaching in the bucket to choose a variable at random. Spotting a student sitting by himself, Bruce asked, "Where's your partner, David?"

David pointed to another group, where the other student had defected, dramatically announcing, "He betrayed me!"

Bruce called to the other student, "Come back here, you are with David." To the class at large, he announced, "OK, you have five minutes. I'm going to write the equations on the board."

As he wrote, several of the students called out questions, voicing their confusion over the assignment. "What are we supposed to be doing again?" Bruce stopped his writing to address the class and rephrase the directions. "I'm looking for a word problem."

A student put his head in his hands. "I'm confused," he muttered.

A student held up a worksheet from the previous week. "Can we use this?"

Bruce nodded. "You can use any resources you have available."

"Hey, Mr. C!" A student waved Bruce over. "Can you look at what we have?"

Bruce read the students' work and nods. "OK…so you've got three different people running at three different times. Tom runs for four seconds, Jerry runs for five seconds…how far does Tom go? Yeah, that's three pieces of data in there that have nothing to do with anything. That's a great idea."

He moved over to the next group, three girls loudly debating. "No it's not, that's the distance," one of the girls said. The other stood and leaned over her shoulder. "No- here's what I was thinking- you have the vo and the xo," she said, referring to the parts of the first and second kinematics equation.

"But if she's giving them a, it's a two step equation!"

"No, look! Think about it! It's gotta be three steps. They have to find vo first. Then they have to find a. Then they have to plug that into that equation and—"

"But we have to give them time, though," a third group member interjected.

Another table called for Bruce to help. He moved over to their table, leaning down to talk to them. One held up his paper for inspection. "Mr. C, does this sound too easy?"

"Yes, it does," he said. "Just kidding, I haven't looked at it yet." He read the problem and pointed out, "75 pounds, that's a small truck." Continuing to read, he nodded his head. "I like it, I like it! So it falls under equation two and you are combining it with f=ma."

Cheers erupted from the table of girls. "Yeah! We got this!" One squealed, leaping from her chair in excitement.

After another few minutes, Bruce announced, "OK, two more minutes and then we'll solve some problems."

"Wait! Wait!" students protested.

Bruce pulled up a chair next to one of the students' tables. "All right, finish up, we're going to start calling on groups in a minute."

After a few more minutes, Bruce said, "OK, we are going to go counterclockwise, this way, starting with your group, because I know your question is ready."

"How come you can't start with Shanna's group?"

"NO!!!!" The girls yelled.

"Come on, said Bruce. "OK, you've got a minute and a half to solve this. If you have the answer, raise your hand. If you answer correctly in a minute and a half, you get an extra credit point. If no one does, and you can solve it for us, you get the extra credit point. Got it?"

Two students came to the front of the room. One read, "Aaliyah pushed a 70-foot—"

"I can't hear you!" "Louder!" said students in the audience.

The student raised his voice. "Aaliyah pushes a 70 kilogram rick down a cliff with an acceleration of 2.5 meters per second squared. What force does gravity pull a 70 kilogram rock with?"

"Wait…so Mr. Cohen, we have to find the acceleration? Because as far as I can see it would be force divided by acceleration, just to get the mass."

"well…" Mr. Kolb said.

"So you have to find a new acceleration?"

"You have to find the force, the force by which gravity pulls that rock with."

"But don't you have to find the acceleration?"

"30 seconds left!"

A student raised her hand. "686 newtons?"

"We have a winner! OK, 686 newtons, how is that?"

The student slid her hands across the desk. "Because you multiply 9.8, the gravity," she said, referring to the numerical value for the acceleration of gravity for a free-fall object.

"A ha! We didn't give you that it was 9.8. They got it!"

"But I thought you said they didn't give you acceleration?"

"But they mentioned gravity in the problem itself, so it said gravity."

E-3. Instructional Vignettes for June

Vignette 1: The Criterion Referenced Test. *June was clearly annoyed, frustration palpable as she paced in front of the room. As I set up my computer, she walked over and sat next to me. "So we're not actually going to do the lesson today, except for the last thirty minutes, maybe," she said. "We have to take a criterion-referenced test. All the science classes have to take it." She went on to explain that the criterion referenced test had been written by another first year teacher in the department, who she described as "A TFA'er [Teach for America] who wants to go to medical school," and she hadn't been allowed to give any input into what would go on the test or how it was constructed. She thought that if all the science teachers had to give it to their students, the entire department should have created the test collaboratively, or at a minimum, the teachers should been able to provide feedback once the test was created.*

She showed me a copy of the original test, and pointed the tiny print, the number of questions crammed onto one page, and the advanced vocabulary. "Just by giving them an assessment that looks complicated, they break down, " she explained. Concerned that the test would be daunting for her students and they would not even attempt it, she went to the department head with requests for accommodations. Her supervisor had conceded to enlarging the print and expanding the test into three pages, as well as agreeing to extra time, but those were the only allowances. However, June confessed that she also planned to read the questions to them and paraphrase if necessary, as she felt the vocabulary was at a higher level than most of her students could read. With her face set in a grim line, she declared, "I'm reading it to them and I

don't give a shit. It's a shitty test. And I'm telling them that I didn't make it and I'm sorry they have to take it."

June was not exaggerating. The first words out of her mouth when the class started: "So don't get mad at me…I'm going to preface with that. This is a science assessment, and everyone has to take it. It's graded but it's graded on how hard you work on each section. I didn't make it nor did I want you to take it. " She went on to explain the purpose of the test and to give them encouragement. "Don't get overwhelmed by this- I know there's some things on here we haven't covered yet. The purpose of it is to read something and answer questions about it, or if there is data they want you to graph it. All of you are capable of doing this. If you want me to read something to you, I will do that. If you want to know what something means, I'll do that for you too." As she passed the tests out, she added, "…the sooner we finish this, then we can move on."

True to her prediction, the three students present (one was absent) resisted immediately. Susanna lay her head down on the table and muttered, "I don't want to do this." June replied, "I know, but you'll do it anyway. I don't want to give you guys this test, but I have to." She crossed over to Susanna and crouched down to talk with her face-to-face. "You are too smart not to do this. Come on, the first one isn't hard at all. What is it asking?" With a sigh, Susanna picked up her pencil and began to work. June began to rotate between the students, encouraging them to continue. When Ashley put down her pencil and took out her phone, June walked over and asked her if she was finished. When Ashley shook her head, June advised, "Why don't you take a short break and then try again?" The student looked away. "I don't want to." June looked at her

paper. "Come on, you are almost done. Did you read this last one? What does it say?" When the student didn't respond, June began to read the passage to her quietly. The student pointed at the answer. "OK," June said, "Now write that down and you are done!"

After class, June felt proud that each student finished the test, though some had needed repeated encouragement: "I think they actually did well on it. I mean, Susanna, it was like pulling teeth. But, when she realized, like the questions were not that hard, and she could answer them, it was just like annoying, which I agreed with." She went on to critique the test, which she felt was not a true test of science skills or content. One of her students struggled in particular with the difficult wording, and she commented, "So you don't know what alternative means. You are able to identify differences; however, you don't know what the word alternative means. So for you to be able to analyze this and show a difference- you could do that easily, so that's the skill. But you are unable to read 'alternative' because you have some literacy issues. So it's not saying, you're not good at science, it's saying, you have trouble reading. So that test is not…showing comprehension, it's showing that they have difficulty with certain words."

Vignette 2: The M&M experiment. *Four students sat, two to a table, facing the front of the room. June crossed to each table, handing them graphic organizers to that scaffolded each of the steps in the scientific method. "I'm giving you a new worksheet. What should be the first thing you do?" She asked.*

Three students answered in unison, their practiced reply indicating this was a familiar question. "Name and date at the top!"

June nodded called out to a student. "Can I give you a task?" The student nodded. "Can you put water in these three cups?" She held out three clear plastic cups, stacked on top of one another. The student obligingly took them and went to the sink at the back of the room to fill them.

"OK, I'm coming around," she announced to the other students, grabbing a large bag of M&Ms from the front lab table. "OK, I'm going to put the M&M's…" as she placed a small bag of M&M's on a table next to a student's paper, the student immediately picked up the bag and ripped it open. She cautioned, "If I see you eating them, it's over."

"But why!?" said one student.

"Because she might let us eat them later," his partner replied.

"Miguel knows me so well! The reason is that you have to use them first for the experiment," June explained. Two students at the opposite table began talking loudly. June leaned back against her desk and crossed her arms, staring at them expectantly until they noticed her look. As the talking faded, June asked, "Can we listen to instructions?"

One of the students said, "Yes."

"OK then. I'm going to come around and place one bag of M&Ms next to your paper. Do not eat them." The student returned from the back of the room balancing the three cups of water. "I need a cup at each table, quickly," She told him. As he set the cups down, she continued. "What I would like you to do first…" She stopped as talking started again. "I'm being serious right now. You are taking advantage of me."

"Come on, Ms. L," said a student. "We got this."

"All right, what I need you to do—open your pack of M&Ms, but only to look at them. In the first box, what does it say, [student name]?"

"Make observations."

"OK, so what I want in that box is objective observations. Should anyone write, 'M&M's'?"

"No," answered a student.

"OK, good." The door opened and a student entered, having just returned from the restroom. June said, "Someone tell Ashley what we are doing, quickly."

A student said, "You aren't to eat the M&Ms. You can only look at them."

Directing the student to a seat to work with two other students, she said, "OK, so right now you need three objective observations." She waited a few moments while students started writing, and then began to check on students' work.

As she approached a table of three students, one of the students at the other table called out, "I'm done!"

She crossed over to their table instead, glancing at his paper. "What about your teammate?" The other student looked up and shook his head. June continued, "So together, I need you to have three objective observations. So as a scientist, what do you see?" She squatted down to get closer to the student's level, and he murmured an answer. "Good, keep going with that thought," June encouraged him. She turned back to the rest of the students. "OK, so if you have done the first step, what I want you to do now…what is the second step of the scientific method?"

"Questions!" called a student.

"OK. So what I want you to do is put some questions you could do. So what's one question?" She asked.

Several students offered ideas. "Why are all my M&Ms different colors?"

"How many M&Ms are in a bag?"

"Why are there M's on the outside?"

"OK," said June, "Let's see if we can come up with a question that involves the materials you have- the water and the M&Ms."

"Why are we putting M&M's into the water?" A student offered.

"OK, now how can you make that into a question you can investigate right now?" June countered, walking over to check on the other table. To the two boys working together, she admonished, "I see no questions. I see written-on fingers and chapstick, but no questions."

One of the boys said, "What would happen if we put the M&Ms in the water?"

June smiled and said to the class at large, with obvious pleasure, "All right! We're starting to think like scientists, you guys!" She turned back to the two boys. "OK, so what would you predict if you did an experiment with this question?"

"It might change color?" the student suggested.

"OK, write that down. Now, Daniel," She said to the other student, "Why don't you come up with a second prediction, and then you share." June crossed to the other table, where three girls sat chatting, having completed their first step. "Your task is an

individual one right now," June told them. "You come up with a prediction"—she turned to his partner—"then YOU come up with a prediction, and then you share."

June returned to the other table with the two boys. "OK, now I want you to actually do it. Don't put all of them in the water, because then you can't eat them." She watched as the students each dropped a handful of M&Ms into the cup, swirls of color immediately appearing as the bright candy coating began to dissolve into the water. "OK, now put your observations on the back," she prompted them, referring to the graphic organizer. She crossed back to the other table, repeating her instructions with the second group.

Returning to the first table, she read what one of the pair of boys had written on their graphic organizers. "I like this," she told him, tapping on one of the lines of text he had written. She said to the class again, "I see a lot of observations here! Scientists make a lot of observations."

After another moment, June said, "So the next step after you make your observations is to flip your paper. I need you to be looking at the explanation box. What I want you to tell me—and this is your exit ticket—is to tell me, why did whatever happen, happen? So the observations you made, WHY did that happen? Don't REPEAT for me what happened. I want to know WHY. OK, so Miguel, tell me what I want you to do?"

"We are supposed to be writing why the water turned colors."

"Yep. OK, there are four minutes left, and you are going to need all of those four minutes. So tell me why it happened—don't tell me what, tell me why."

After students had handed in their exit tickets, one asked, "Can we eat the M&Ms?"

"Yes. And you have to drink the colored water," June joked.

"EWWW!" Exclaimed one of the girls. One of the boys tipped back his glass, pretending to drink.

"I'm just kidding," June quickly said. "Don't drink it, because it's sink water." As students munched happily on their M&Ms, June told them, "And don't tell your next period teacher who gave you the candy."

The bell sounded, and students shuffled out the door, one of the boys laughing and saying, "I'm gonna tap that!"

June called out to the student, and he turned back at the sound of his name. She came over to him. "I care about you, but I also care about your grades. What happened to your leg?"

The student pulled his pant leg up slightly to show her a scratch he had been complaining about during class. She made a face at him, saying, "Suck it up!"

Appendix F: Rhizomatic Glossary

The terms below are key constructs from rhizomatics that I "plug in" to my study and use to analyze the negotiation of teaching practice of the three participants featured in my dissertation. Scholars of Deleuze argue that our very language reproduces linear thought structures, which in turn perpetuate the status quo of individualism and essentialism, and thus new ways of discussing phenomena are required (St. Pierre, 2000/2004/2011). Several of the concepts Deleuze and Guattari invented in response to particular philosophical problems (1987; 1992) also resonated for my study. I provide a brief overview of these terms below, drawing my definitions from Deleuze and Guattari's (1987) seminal work *A Thousand Plateaus* and contextualizing them to teaching activity in classrooms.

Assemblage

An assemblage is a collective of elements that might include people, objects, physical space, ideas, and/or discourses, and which work together to produce a particular function. For example, a person might form an assemblage with a car (and all its various parts), a key, knowledge of driving, and driving directions; working together, these pieces produce driving (the function). Similarly, a teacher might form an assemblage with her students, knowledge of the content, physical objects like desks and whiteboards in the school in which she teaches, the culture of the school itself, and relevant policy mandates, which work together to produce teaching (the function). The term assemblage refers both to the constellation of elements comprising it as well as the processes produced by the specific combination of elements.

Becoming

Becoming is both a noun and a verb used to indicate a micro-transformation (e.g., a moment of teacher-student connection that contributes to relationship-building between them), and/or the process of micro transforming (how that momentary connection between student and teacher occurred and/or played out) in relation to a context. In Deleuzian philosophy, *becoming* is used to describe the movement from one state to another (e.g., becoming-different, becoming-teacher, becoming-student), thereby expressing that the act of becoming is constant flux. From a rhizomatic perspective, becoming expresses our constant state, and thus is used in place of the term *being*, as people and the world around us are constantly changing, growing, and developing. We can never *be*, because from moment to moment we are always becoming something else. In the context of teaching, the concept of *becoming* may help express a relational view of teacher development that is non-linear, multi-directional, and constantly shifting and morphing.

Line of Flight

A line of flight is an escape from the typical or status quo, a momentary mutation or change that slips through the cracks of institutional or society structures or discourses. A line of flight is not necessarily seen as positive. Instead, it is considered merely a deviation from the usual. In schools, a line of flight might take the shape of a student-led lesson, a moment of role-reversal or boundary crossing between the normative interaction of teachers and students, or even a loud laugh in a quiet study hall. Lines of flights are temporal, however. Because society is overcoded, molar lines are ever-present and will

recapture the line, returning to the status quo. The lesson will end, the teacher will resume her position of authority, or the laugher will be shushed. But in that moment of escape from the norm, the larger system is shuffled and change occurs (though it may be infinitesimal). If reconstructed over time, lines of flight have the potential to shift the status quo and result in larger changes in the system as a whole.

Molar/Molar Lines

Molar or *molar line* refers to a normalizing force that binds social activity to the status quo. Also known as "overcoding," these lines might appear as institutional structures, existing conventions, or normative discourses—anything that serves a corrective function to maintain the current power balance. These rigid lines create stratified or striated space—that is, a situation that offers many barriers to creativity or non-conformity. In schools, molar lines such as policy mandates, bell schedules, and emphases on rote instruction may contribute to striated spaces that constrain new teachers in enacting equitable pedagogy.

Molecular/Molecular Lines

Molecular or *Molecular lines* are the forces that actually carry out the normalizing work of molar lines. Where molar lines are rigid, molecular lines are supple and flexible. Thus, they might reinforce the work of the molar, serving to reproduce the status quo, or break free and form a line of flight. For instance, the work of society is molecular—governing bodies may make laws, but the masses must decide whether to follow them. Similarly, the day-to-day work of the teacher is molecular. Her teaching is "overcoded" with many molar lines, but ultimately she has some agency in her responses to

bureaucratic structures, curricular norms, and discourses, and might find temporary lines of flight with her students.

Multiplicity

Multiplicity is used to describe a collective, and can be used as a synonym for *assemblage* or *rhizome.* From a rhizomatic perspective, everything can be viewed as a multiplicity. As humans, we are multiplicities of organs, past experiences, desires, thoughts, limbs, facial expressions. A classroom and larger schools are also multiplicities, and thus a teacher is a multiplicity within a multiplicity within a multiplicity. The teacher-classroom-school amalgam can be viewed as a nested system--as a complexity theorist might describe it--or as multiplicities "plugged into" other multiplicities serving particular functions as they come into composition (e.g., any of the possible functions of classrooms and schools, such as teaching, learning, or social reproduction). Deleuze and Guattari (1987) would call these connected multiplicities a "machine," drawing attention away from the pieces that compose the multiplicities and instead to what they collectively *do*, or what function they serve together. The term "multiplicity" is particularly important in the context of my study because it draws attention to the *multiple* nature of teaching and thus allows me to use language as a tool to shift discussions of teaching from individual actions to those collectively constituted by several interacting elements.

Rhizome

A rhizome is the central figuration of rhizomatics, a philosophical perspective created by French philosopher Gilles Deleuze (partly in conjunction with psychoanalyst Felix Guattari). The rhizome, which is literally a tuber of unpredictable growth patterns,

serves as an alternative to dominant Western ways of emphasizing the autonomy of the individual and seeing the world as linear, hierarchical, and orderly (which Deleuze and Guattari call “tree” or “arborescent” thinking). Instead, the rhizome is acentered, non-linear, comprised of multiple heterogeneous elements, and operates via connection rather than binary or separation. From a rhizomatic point of view, all social activity is collective. Extending this line of thought to the classroom, teaching is rhizomatic, meaning it is a production of a rhizome or assemblage comprised of multiple people, material objects and space, forces, and ideas acting and interacting simultaneously. Because the rhizome is composed of various molar and molecular lines, it is possible to “map” rhizomatic activity, or the workings of rhizomes, by finding the lines of flight that emerge.