# Nonlinear Negotiations

## Constructing Practice as a First-Year Teacher

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## Abstract

In this article we present two case studies of first-year, secondary science teachers who participated in an urban teacher residency. We adopt a situated analysis approach, framed by rhizomatics, a non-linear theory of social activity, to investigate the ways they attempted to enact practices consistent with the inquiry-based, social justice focus of their pre-professional program. Our investigation was guided by the question, "How do two science teachers construct their instructional practices in their first year of teaching?" We argue that the practices that emerged for both teachers were shaped by negotiations between the teacher, her students, and other contextual factors. As such, teaching practices are not a direct product of teacher learning, but are rather co-constituted by multiple elements, and therefore are fundamentally hybrid. Such insights add to the extant body of research on the relationship between teacher learning and practice and can assist in developing teacher preparation programs that can support the non-linear, multiplicitous, and relational nature of teaching.


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## Introduction

> We are just like, really dumbfounded by the fact that—you think you have made a good breakthrough, and not that it's for naught, because then you might have changed a couple students' minds, but in the grand scheme of it, you feel like, it's a life size board game of like, Chutes and Ladders or something. Where like, you are never going to make it to a hundred, because there's a damn slide right there! (Mauro, exit interview)

In the preceding quotation, Mauro, a high school science teacher, discusses the complexity of teaching with which he and his fellow new teachers were grappling, comparing his journey through his first semester of teaching to a childhood game in which landing on certain spaces interrupts a unidirectional trajectory with setbacks and jumps forward. Although dominant modes of thinking tend to position teaching and learning to teach as technical, process-product acts, as Mauro indicates—and recent educational scholars have also argued—these processes should be considered complex, relational phenomena (Cochran-Smith, Ell, Ludlow, Grudnoff, & Aitken, 2014; Opfer & Pedder, 2011) jointly arising from multiple actors and contextual conditions (Strom, 2015).

In this article, we adopt a situated analysis approach (Clarke, 2003), framed by notions of rhizomatics (Deleuze & Guattari, 1987), to investigate the nomadic pathways of the teaching practices of two first-year science teachers who participated in an urban teacher residency. Our investigation was guided by the question, "How do two science teachers construct their instructional practices in their first year of teaching?" Through two case studies, we show that the teaching practices that emerged arose from negotiations between the teacher, students, and other contextual factors. Drawing from this evidence, we argue that teaching practices are *hybrid*; that is, they are mixtures that are not a direct result of teacher learning but rather co-constituted or coproduced by multiple elements (only one of which is the teacher herself or himself). Such insights add to the extant body of research on the relationship between teacher learning and practice and can assist in developing teacher preparation models that can support the nonlinear and collective nature of teaching.

## Rhizomatics

To articulate an alternate conception of teaching practice that departs from the normalized view of the teacher as an autonomous actor who controls her or his actions and, by extension, her or his students' learning, we draw from rhizomatics (Deleuze & Guattari, 1987) to recast the act of teaching as constituted by the interactions of a particular mixture of teacher–student–context. In this view, teaching activity jointly arises from the "coming into composition" (Martin & Strom, 2015) of multiple human actors (e.g., teachers, students, colleagues, administrators) and nonhuman elements (e.g., content, physical space, school culture, bell schedules).

As such, the practices of beginning teachers are fundamentally hybrid productions rather than linear transferences.

Rhizomatics (Deleuze & Guattari, 1987) is a materialist philosophy that provides a way to theorize the day-to-day micropolitical activity of teaching, offering conceptual tools with which to analyze how actors and ideas in a particular classroom/school setting work together to produce teacher learning and practice. Rhizomatics provides a cluster of concepts that may be employed both theoretically and methodologically to disrupt Westernized, linear thinking patterns (Strom, 2015). Deleuze and Guattari (1987) argued that dominant thought is *arborescent thinking*. That is, Westernized thought simulates a tree, with one trunk (or universal idea) that reproduces itself into branches in a unidirectional, hierarchical trajectory upward. Nonlinear thought, however, approximates the rhizome, which, scientifically defined, is a bulb that grows unpredictably in all directions, both above- and belowground. An example of a rhizome is the ginger plant, which develops via offshoots sprouting from multiple, acentered nodes along the subterranean stem. Philosophically, rhizomes comprise multiple, heterogeneous elements that connect, and as these elements forge new connections, the rhizome changes or becomes different. Rather than a single unity operating in isolation and reproducing itself (i.e., the tree), the rhizome emphasizes multiplicities, or collectives, comprising mixtures of elements that work together to produce particular processes.

Employed as an analytic tool for theorizing processes of teaching and learning, rhizomatics can assist one to consider teaching and learning not as solitary acts conducted by an autonomous teacher but rather as events collectively co-constructed by multiplicities. Teachers are always part of larger constellations of heterogeneous elements that come into composition to form a rhizome (deFreitas, 2012). Each of these elements—the teacher herself or himself and the myriad understandings, intentions, and background experiences the teacher brings; the students and all the knowledge and experiences they bring; the classroom space; the content and associated ideas about the discipline; the larger school environment, including other teachers, school leadership, and school culture; and so on—comes into composition with other pieces of the teaching rhizome to produce particular processes (such as teaching and learning). By examining the relationships and interactions among elements in these constellations in connection to what is produced in different teaching events, we can theorize how these elements work together in different contexts and circumstances to collectively produce teaching and learning.

Importantly, rhizomatics also fits well with current constructivist perspectives of learning (Strom, 2015; Strom & Martin, 2017), including sociocultural theory (Vygotsky, 1978), which view knowledge as socially constructed and mediated by multiple actors and tools. Rhizomatics adds to this theoretical conversation about teaching in at least two ways. First, although social constructivism is helpful in thinking about processes of learning, it is an epistemological perspective, not a specific theory that explains *teaching activity* (Richardson, 2003). Rhizomatics offers

a conceptual frame with which we can theorize the relational processes of teaching themselves. Second, although social constructivist and sociocultural perspectives on learning are taught in many teacher preparation programs (Cochran-Smith et al., 2016), the underlying commonsense ontology of an autonomous, isolated teacher who "does" teaching as a transaction is not troubled—which, as we have argued elsewhere, may partially contribute to the difficulty teachers experience when attempting to enact practices consistent with a constructivist stance (Strom, 2015). Rhizomatics, instead, shifts toward a view of reality as relational, multiplistic, and mobile, which can help the educational community at large understand and participate in teaching activity as a process of *coming into composition* with multiple material and discursive elements.

## Teaching as a Hybrid Act

Few studies actually focus directly on the ways that the human and nonhuman elements of schooling interact to produce teaching practice in the first year of teaching. However, examining the body of literature regarding first-year teaching from a hybrid, rhizomatic perspective shows that although teachers do bring their learning from their preservice preparation into their new K–12 settings, the translation of that learning into pedagogical action is mediated by multiple factors. These factors, which range from teachers' own beliefs to the characteristics of their students to the school leadership's instructional vision, work together to shape what the teacher is able to do pedagogically.

As multiple studies and research reviews have shown, the beliefs that teachers develop early in life about teaching as a teacher-centered, transmission activity tend to persist through their university preparation and into their classrooms (Allen, 2009; Kagan, 1992; Massengill, Mahlios, & Barry, 2005). When these deep-set beliefs interact with other constraining variables, such as struggles with student behavior (Massengill et al., 2005), colleagues who encourage lecture-based teaching (Allen, 2009), or the teacher's lack of confidence (Eldar, Nabel, Schechter, Tamor, & Mazin, 2003), there may be a tendency to revert to direct instruction. As an illustration, Allen (2009), interviewing 16 new teachers in Australia, found that both veteran colleagues who modeled lecture-based teaching and the conceptions of teaching the novices had gained as young students influenced the novices' instruction. As a second example, in Starkey's (2010) study of teachers integrating technology into their teaching, one teacher confessed to using technology much less than his colleagues in his math classes for two reasons. First, he believed that mathematics should be learned by hand rather than on a computer, and second, he was not confident in his own ability to use technology successfully in his lessons. Thus his more traditional beliefs about math learning combined with his lack of faith in his ability to infuse technology meaningfully into his teaching to shape his teaching in ways that underemphasized a technological component in mathematics.

Other studies have illuminated the instructional negotiation that occurs as teachers interact with students (Bianchini & Cazavos, 2007; He & Cooper, 2011; Hebert & Worthy, 2001; Luft & Roehrig, 2005; Saka, Southerland, & Brooks, 2009), which shapes their emerging practices. For example, Bianchini and Cazavos (2007), investigating the inquiry-based practices of two first-year science teachers, found that both science teachers struggled to differentiate their instruction to meet the needs of the wide range of learners in their classes. As a result, both teachers lowered the rigor of their classes overall, with one commenting that "he would be satisfied if his struggling students simply mastered basic science content" (p. 597).

In other work, explicit examples of the development of hybrid practices have shown evidence of teachers' preservice learning as well as responses to student factors (Brashier & Norris, 2008; Hargreaves & Jacka, 1995). For example, Hargreaves and Jacka detailed a case study of a teacher who, despite her professed commitment to democratic teaching learned in her initial teacher education program, reverted to a more authoritarian, teacher-directed stance in response to undesirable student behavior. Yet, despite adopting what she termed "behavioral management" techniques that she imposed on students, she continued to attempt to preserve democratic elements—such as facilitating conversations with her students to get their input on classroom routines and behavior expectations. Likewise, in Brashier and Norris's (2008) qualitative study of early-grade teachers' use of "play" and "centers," the researchers found that teachers reduced their use of these two developmentally appropriate strategies learned in their preservice programs, but did not necessarily abandon them entirely, in response to students' rambunctious behavior during these activities. In other words, these teachers hybridized their practice to accommodate both their preservice learning and student actions.

Contextual conditions at the school level combine with the aforementioned influences to form unpredictable "mixtures" (Deleuze, 1990; Deleuze & Guattari, 1987) of elements that, we argue, work with teacher learning to jointly produce new teachers' practices. Saka et al.'s (2009) comparative case study of two teachers prepared in an inquiry-based preparation program provided an example of how these mixtures might function. One teacher taught in a school with a history of high student achievement, a school instructional vision that supported a constructivist paradigm, a collaborative school culture, and colleagues who valued inquiry-based pedagogy. His students were a homogenous group who happily engaged in his instructional activities. These elements worked together to produce and reinforce the teacher's inquiry-based pedagogy. Conversely, the second teacher in the study taught in a school that struggled to meet federal achievement benchmarks, had administrators who advocated for didactic teaching methods, and featured an isolated school culture. He also struggled to meet the needs of his students, whom he characterized as unmotivated, evidencing his own deficit perspective. Although the teacher attempted to implement inquiry-based lessons in the beginning of the year, over time, the functioning of these conditions and elements together influenced his instruction to become more lecture-based.

The *problem of enactment* (Kennedy, 1999), or the difficulty of putting learning about teaching into practice, is not new. However, few in-depth studies have traced the movement of learning into practice and focused on the negotiation of that practice within the day-to-day activity of first-year teachers. We suggest that information about processes of first-year teaching practice can contribute to research on the ways teaching knowledge and skills move from the university to the classroom, which in turn can prove helpful for teacher educators and teacher preparation programs as they seek to prepare teachers to serve an ever-diversifying school population.

## Methods

As previously noted, our study was guided by the question, "How do two science teachers construct their instructional practices in their first year of teaching?" We adopted a postqualitative methodology (St. Pierre, 2011), which takes a perspective of research grounded in the posts (poststructuralism, posthumanism, etc.); aims to open up methods for interrogation; and investigates phenomena as multiplicities to construct complex, yet partial, understandings (Ellingson, 2009). This methodological frame, then, aligns well with a theoretical lens informed by rhizomatics. From this grounding, we designed a study drawing from multiple qualitative methods, including case study (Stake, 1995), constructivist grounded theory (Charmaz, 2006), and situational analysis (Clarke, 2003), which, together, allowed for a mapping and theorizing of constellations of factors interacting in each teacher's setting. In the following pages, we describe the study context and participants, data sources and collection procedures, and methods of analysis.

### *The N-UTR Program*

The Northeastern Urban Teacher Residency (N-UTR) program is a hybrid teacher preparation program based on the medical residency model. The program, which offers a fifth-year master's of teaching (MAT) degree, is a partnership between a public university and a highly diverse urban district in the northeastern United States. To mediate problematic power relationships experienced by school–university partnerships, the program leaders have adopted a "third space" perspective, meaning that they would work together to create a hybrid space honoring knowledge and experiences brought by all stakeholders (Klein, Taylor, Onore, Strom, & Abrams, 2013). During the 15-month program, teacher candidates first work with local youth in summer internships, followed by a yearlong placement coteaching with a selected mentor teacher. For the duration of the year, residents attend one 4-hour class per week, which integrates theoretical foundations and teaching methods. The N-UTR program is grounded in a social constructivist philosophy of learning (Mehan, 1981; Vygotsky, 1978) and promotes teaching and learning that

are inquiry based, positioning students as active meaning makers (Freire, 1970). Faculty members provide course work experiences that model the practices of such inquiry-based teaching. Social justice is also an important part of the curriculum, with emphases on culturally and linguistically responsive teaching (Villegas & Lucas, 2002, 2011) and making issues of social inequity and power imbalances explicit in the classroom (Cochran-Smith, 2004).

### *Participants and Context*

Our participants included Bruce and Mauro, two graduates of the N-UTR program. Mauro, a 25-year-old male of Cuban and Colombian descent, grew up in a suburban town adjacent to the district in which he eventually was hired. An excellent student, Mauro recalled that his family had served as a strong source of academic encouragement. He developed an interest in the sciences in high school and attended an Ivy League college to study environmental science. After graduation, he applied to the N-UTR program because its focus on social justice spoke to his commitment to issues of environmental justice. Upon completion of his residency year, Mauro accepted a position at Lincoln High School, the site where the N-UTR residency was based. His new assignments included teaching both freshman (9th-grade) environmental science and 11th- and 12th-grade earth science, both of which were "low-track" classes. Lincoln was a large, diverse urban high school located in a working-class section of the city. Notable was the students' language learner population, which accounted for nearly one-third of the total student population and featured speakers of 26 different languages. The school's principal was an ardent supporter of the N-UTR program, and pedagogically, he advocated for inquiry-based approaches to teaching in science and mathematics.

Bruce, a 25-year-old orthodox Jewish male, had degrees in physics, theatre arts, and Jewish studies. He had lived in both relatively affluent and working-class neighborhoods within an hour's drive from the district in which the residency was situated. Like Mauro, Bruce cited the N-UTR program's social justice focus as his motivation for entering the residency. At the end of his preservice year, Bruce was hired to teach ninth-grade physics at a relatively new magnet school with a focus on college preparation, Northeastern College Prep (NCP). The school was located in a high-crime section of the city, and the buildings in the area still bore scars from the destructive riots that had rocked the city more than four decades before. At the time of the study, NCP was "co-located" with two other schools (both charters), meaning that all three schools shared one building. Bruce shared a classroom with a French teacher that was not outfitted for physics or any type of scientific laboratory activities. The school also experienced a shift in leadership three months into the school year, with the school's founding director unexpectedly retiring and a new principal taking over.

### *Data Sources and Collection Procedures*

Our data sources encompassed observations of teaching, "lesson debrief" interviews, and longer, semistructured interviews. One of us conducted the observations, which allowed the viewing of the enactment of teaching practice over time, as a participant observer (Adler & Adler, 1998). For each teacher, a complete unit of instruction was observed, and additional observations were conducted at the start of the year and the conclusion of the semester to provide an understanding of classroom dynamics and the evolution of student–teacher interaction over time. After each lesson, a 15- to 20-minute debrief with the teacher was conducted to capture the in-the-moment thinking that might not have been possible for the participant to reconstruct at a later time.

In addition to these two data sources, one researcher conducted two semistructured interviews (Merriam, 2009) with each teacher, which provided glimpses into the teacher's thinking and perception of his work over time as well as an opportunity to conduct "member checks" with participants for preliminary analytic themes. We developed a set of open-ended questions prior to the interview, which served as a guide rather than a strict protocol (Patton, 1990). All interviews, whether performed informally after observations or as a semistructured interviews, were transcribed verbatim.

### *Analysis*

Constructivist grounded theory analysis (Charmaz, 2006; Clarke, 2003), our method of analysis, approximates a traditional grounded theory approach that begins with assigning open data codes (Clarke, 2003). These are then used to create categories and begin writing analytic memos (Strauss & Corbin, 1990), which in turn are compared to literature, other data, and new research in an iterative manner (Glaser & Strauss, 1967). However, this process is undergirded by the understanding that the researcher is an essential part of the research process—rather than an objective, distant third party—and the focus moves from generating *theory* to the process of *theorizing*. Situational analysis (Clarke, 2003), a more explicitly relational and postmodern iteration of grounded theory, focuses on the research situation itself as a unit of analysis, employing an analytic layer of maps to show situational elements in their collectivity. The maps serve as a tool for the researcher to analyze how these elements interact and negotiate and to examine the issues and positions that contribute to social processes within the situations under study (Clarke, 2003). From these maps, researchers proceed to memoing and substantive theorizing (consistent with a focus on process rather than a product of substantive theory).

We began our analysis by making notes and constructing initial themes, focusing on actions and processes rather than topics or things, which is consistent with a Deleuzian focus on processes and larger agendas of change for social justice (Charmaz, 2006, 2011). As an organizational tool, we also created charts that plot-

ted the quotations, snippets of action, and observations by key word or theme. As we pulled evidence to map and plot into the charts, we also began to write analytic memos (Charmaz, 2006) that contained lengthier descriptions of events and to identify linkages with theoretical and empirical literature. We used these memos, in conjunction with the maps and key word charts, to construct the findings we present in the next section.

### *Trustworthiness*

An essential part of trustworthiness is an interrogation of positionality and the ways that our own researcher multiplicities may have shaped how the study and the stories are constructed. We are three straight, cisgendered women; two of us are White and one is African American. All three of us are from working-class families and are former educators—two worked in high-poverty, diverse urban settings, and one taught in high-poverty rural settings. The lead author also worked as graduate assistant with the N-UTR program during her doctoral studies. Although we recognize that we have made "agential cuts" (Barad, 2007) with the design, data collection, and analysis that have been informed by these positionalities, we have also employed a number of strategies to attempt to create as transparent a study as possible and to demonstrate that the research is credible and plausible (Merriam, 2009). We designed the study to provide multiple opportunities for triangulation (Mathieson, 1988) at every stage of research, linking, and searching for commonalities or confirmation of findings among and between interviews, observation scripts, and debriefs. We also embedded member checks into interviews and presented theme constructions to the participants throughout the process, incorporating their feedback and expansion on these ideas.

## Findings

In this section, we present two overarching themes. First, both Mauro and Bruce actively negotiated with both their students and context, and second, these interactions shaped the practices that emerged in their classrooms. Within the first theme, teachers had to build relationships and trust with students to ensure their participation, which was fundamental to enacting the type of democratic learning that creates and sustains an equitable classroom community. Yet doing so was extremely challenging, and teachers wrestled with their desire to enact socially just, participatory, inquiry-based lessons; with student responses that triggered deep-set tendencies to revert to status quo teaching methods; and with their own first-year insecurities—all of which contributed to enacting teaching for social justice in fits and starts. At times teachers enacted forms of socially just instruction, whereas at other times their pedagogy was more traditional, and thus their teaching could not be characterized as "one thing." Beyond their students, teachers also simultaneously

negotiated with contextual elements and other actors in their settings, including school structures, school colleagues and leaders, and imposed policies. These interactions created both constraining and enabling conditions that influenced what both teachers were able to do pedagogically.

The two layers of factors (i.e., those at the classroom and larger school levels), interacting together, created a complex constellation of interacting elements, producing *teaching-assemblages* (Strom, 2015) that operated differently. From their unique functioning, different hybrids of socially just teaching emerged. In the sections that follow, we discuss the ways that negotiations with students and context shaped the first-year pedagogies of the two teacher participants.

### *Negotiating With Students*

Both Bruce's and Mauro's teaching hinged partially on cooperation and participation from their students. That is, the ways students responded to the learning activities presented affected the extent to which Mauro and Bruce were able to enact pedagogies consistent with those learned in their residency year. As noted previously, the two teachers worked to gain student cooperation and, ultimately, participation in interactive lessons that required students to take part by building relationships. However, they used different strategies to do so and, in part because of differing characteristics and student–teacher interactions, experienced different results.

**Mauro's students**. Interestingly, Mauro was able to establish relatively harmonious relationships with his upperclassmen earth science students but struggled to do so with those in his ninth-grade environmental science classes. Mauro regarded his upperclassmen as mature, focused, and open and was able to work out implicit classroom norms with them from the very beginning. He explained, "[The earth science 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 tacit agreement helped create an environment Mauro called "casual" and "authentic," where students often chatted with each other while completing their assignments. Within this comfortable space, Mauro developed several strategies for relationship building, to which his upperclassmen responded positively. For example, Mauro strove to be transparent with students about his decisions in the classroom. In doing so Mauro acknowledged students as co-constructors who needed to understand Mauro's reasoning for instructional and other classroom decisions and to have access to a range of information to help them take an active role in their own educational experiences. As another strategy, he sought to value his students' voices and experiences with "side conversations," which were short, divergent discussions in which, as Mauro noted, "we take the opportunity to get to know each other and then we go back to doing work." To illustrate, 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 for the student to recap his experience for the class. Mauro congratulated him and then moved students back to focus on the scenario.

Establishing trust and relationships with his upperclassmen contributed to higher student participation rates in activities, which meant Mauro could successfully enact open-ended, inquiry-oriented learning opportunities such as the ones his residency program had emphasized. During these activities, Mauro often asked students to engage in inquiry-based practices, such as observing, hypothesizing, revisiting and reconsidering their previous thinking, and synthesizing pieces of evidence to form a conclusion. At one point, as he introduced 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."

Mauro's ninth-grade environmental science classes differed substantially from his upperclassmen earth science classes. He was unable to establish the same kind of easygoing, comfortable environment he enjoyed with his earth science students, which he blamed on multiple factors—the students were overwhelmed with the transition to high school, they collectively shared a less cordial social dynamic among themselves, and they were less willing to negotiate mutually acceptable classroom norms. Discussing the latter, Mauro commented,

> I've had many conversations [with ninth-grade classes] 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.' . . . Like, it's not appropriate to hit each other.

Rather than being able to engage in relationship building, as he had with his upperclassmen, Mauro focused instead on behavior management, such as adopting a tactic of stopping the lesson and announcing "I'm waiting" when students were off-task.

These circumstances contributed to a tense environment where the likelihood of students participating in ways that Mauro wanted remained unpredictable. For example, Mauro designed an introductory activity to his evolution unit wherein he passed around a large tub with several different varieties of candy, asking students each to select two pieces of candy. Had students responded as he requested, the candy that was left over—the types of candy that were less desirable to students—would provide an entry point into the idea of "survival of the fittest" and serve as the foundation of an activity where students would use the "features" of the leftover pieces to predict how future generations of candy might evolve. However, when the tub made its way around the room and back to Mauro, students had taken far more than the two pieces each that were allotted. Only two pieces of candy remained, too few for him to successfully make his analogy. From interactions like these, in combination with the other circumstances described, Mauro modified his teaching to become more lecture-based and structured, sometimes even modifying his teaching mid-lesson to become more teacher controlled. For instance, during a class

on biodiversity, Mauro determined that his students were acting too rowdily and instead altered the activity on the spot to be teacher-led, posing a set of questions rather than having the students move through the group activity.

**Bruce's students**. From the beginning of the year, Bruce was able to establish easygoing interactions with his students, which were aided by the positivity and enthusiastic behavior students exhibited during class observations. During lessons, students often expressed positive sentiments toward the subject and Bruce: "I love this class!" or "I love physics!" or, after Bruce announced they would be participating in a lab, "Yay! I love labs!" Bruce's ninth graders also seemed to be innately curious and comfortable inquiring about topics, as illustrated by the questions called out by multiple students when Bruce introduced a lesson on free body diagrams: "What's that?" "Is that physics?" "We are gonna diagram my body?" This enthusiasm carried over into class activities, where, for example, students eagerly volunteered to be Bruce's assistant during class demonstrations of physics phenomena.

In addition to his students' open attitude, multiple other factors contributed to the relationships Bruce developed with his students, which in turn yielded high rates of participation in student-centered activities. He cultivated open lines of communication with students, giving out his personal contact information. In the first month of school, he shared, "I actually have had two students who have texted me so far. Which is cool! Um, it's a lot more personal, and um, actually showing that . . . you are not like, a robot." He also cultivated special relationships with students who had been identified by the school and other teachers as "bad" kids—such as Melvin, a student who was frequently in the principal's office. Bruce singled the student out to assist him with physics demonstrations and to lead small-group activities, and the two deconstructed a computer together in Bruce's homeroom. Another example was Anna, a student who, despite troubles in other classes, was a star student in Bruce's class. Bruce explained that he thought she responded so well to him because he "treat[ed] her like an adult, consistently." Her comfort in his classroom was particularly in evidence during a day when she was sent out of one of her other classes and came to Bruce's class to serve as a "TA."

Because of contextual elements that will be discussed in the next section, Bruce felt pressured to teach in what he considered "safer" ways (i.e., not as inquiry-based). However, his instruction could not be characterized homogenously—it was a mixture of direct instruction with interspersed opportunities to visualize physics phenomena and student-centered labs. For example, in a lesson on Newton's laws, Bruce asked students to make observations regarding a bowling ball, which he placed in the middle of the room. When they observed that nothing was happening, he then rolled the ball across the room. From their observations, Bruce and his students constructed the definition of Newton's first law: "an object at rest stays at rest, and an object in motion stays in motion with the same speed and direction unless acted on by another force." The next day, however, students worked individually on

mainly decontextualized math problems, which Bruce defended by commenting that he had to prepare students for a more college-like environment.

In other observations, the influence of Bruce's learner-centered, inquiry-based preparation was clearly visible. For instance, to practice both the mathematics and conceptual elements of dynamics, Bruce asked students to create, in groups, a scenario containing a word problem, using a random variable: *a* (acceleration), *m* (mass), or *f* (force). Each group was to try to create a scenario that was as difficult as possible, although they also had to provide a solution. After each group had created a problem, Bruce created a game: Each group read their scenario to the other teams, who had two minutes to solve the problem for an extra credit point on the upcoming quiz. During another observation, Bruce planned a 3-day lab where students were required to create their own procedures for and enact an experiment with toy Nerf guns to investigate the question of with what force a Nerf gun fires.

### *Negotiating With Context*

In addition to their negotiations with students, both Mauro's and Bruce's teaching practices were shaped to different extents by elements in the school setting. For Mauro, the size of his classes, whether the subject was tested, and his own familiarity with the subject affected his teaching practices. For example, with regard to his upperclassmen earth science class, Mauro had class sizes of fewer than 20 students, which allowed him to work one-on-one or in small groups with students and to easily rotate between five or six pairs or trios of students to check for comprehension and ask probing questions. In contrast, Mauro's two ninth-grade classes were his largest, with approximately 30 students each (due to student mobility, the numbers fluctuated somewhat throughout the duration of this study). The high number of students often complicated social negotiations and contributed to the loss of instructional time, as Mauro struggled to keep his students focused on the task at hand rather than talking to one another about other topics.

Mauro was also very familiar with the earth science content, which he credited as a point in his favor with this group of students: "I'm more successful with the upperclassmen both because I know the content more, and because I taught the content last year." Finally, the earth science classes were not tested, which Mauro felt gave him considerable flexibility in lesson planning and content sequencing:

> 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. Whereas in environmental I don't get as many luxuries . . . [because] you are tested.

Because environmental science was tested, Mauro was on a tightly scheduled pacing guide, which made his lessons more rigidly structured and caused him stress in class if he ran behind.

Bruce, too, was heavily influenced by the contextual elements of his school, including the school leader, a lack of resources, and general instability of the set-

ting. Bruce's principal unexpectedly retired 6 weeks into the school year, and he perceived his new school leader to be more traditional both in terms of instruction and classroom management. Although the new principal observed Bruce at least once, she did not provide feedback about his performance, which led to some anxiety on his part. To make matters even more complex, Bruce found out that the administrator was considering eliminating physics for the following year. Bruce's uncertainty about his position at the school and the new principal's assessment of his teaching contributed to his "not wanting to rock the boat" in terms of his instruction. He explained,

> There is that pressure, and it's not a small amount of pressure. In terms of the change between last year and this year, that's probably the biggest, even more than any pedagogical changes. The sheer, you know, these are your administrators, and they can lay you off. If they choose that physics is no longer appropriate for ninth grade, you're gone.

Bruce's school setting was also characterized by general dysfunction and instability, which he felt interfered with his ability to provide more student-centered activities. 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 that derailed his planned activities. On a day when a fire alarm was pulled by a student, Bruce said as he trudged down the stairwell, "This is every day. I can't get anything done. The intercom goes off, there is an evacuation, someone comes into class. Every day."

Finally, a lack of resources within the school was another condition Bruce perceived to constrain his practice. His classroom was not set up as a science lab, and 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. Furthermore, he had no 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." Instead, he often relied on classroom objects for demonstrations (e.g., using a towel to demonstrate tension, rolling a ball to demonstrate gravity) or brought in his own collection of Nerf guns for experiments.

## Discussion

Bruce's and Mauro's cases both provide evidence that enacting preservice learning in the first year of teaching is a complex and nonlinear process. From a rhizomatic perspective, analysis of teaching activity must happen at the level of multiplicity—and in this case, each of the amalgams presented of teacher–student–context serves as a multiplicity. As noted earlier in this article, the work of the rhizome occurs via connection, as does any social activity, including teaching.

Moreover, Deleuze and Guattari (1987) noted that a multiplicity "changes in nature as it expands its connections" (p. 8). In other words, as connections are made, or as the different elements of teacher–student–context come into composition, those encounters change what is produced; that is, they shape the teaching practices that emerge. In both cases presented here, the specific mixture of Bruce/Mauro, his students, and contextual conditions—and the ways these interacted—dictated what practices emerged. In the following, we expand on two central ideas drawn from the findings: (a) the critical role of student participation and relationships for participatory teaching and (b) the importance of context in the production of teaching practice. We then describe implications for preparing teachers and leaders in ways that take into consideration the rhizomatic activity of teaching and learning.

### *Importance of Student Participation and Relationships*

Contemporary understandings of powerful learning tend to emphasize sociocultural approaches that are learner centered, are grounded in student experience, and engage students in active meaning making (Cochran-Smith et al., 2016)—which are also perspectives of learning that underscore socially just, equitable pedagogies (Hinchey, 1998; Villegas & Lucas, 2002). Learner-centered instruction, as opposed to more traditional, transmission-based models, requires action on the part of the student. As such, it logically follows that students will have an agentic role in such teaching/learning activity because they are co-actors, or co-constructors, in related instructional processes (although not necessarily equal ones). In both cases presented here, student responses were crucial in shaping Bruce's and Mauro's teaching practices, and the relationships forged (or not) between students and teacher emerged as a key factor in influencing those responses.

For Mauro, his upperclassmen responded positively to his attempts to build relationships with them, whereas his ninth graders would not or could not, depending on the circumstances. In turn, these responses impacted the extent to which students were willing to participate in Mauro's lessons in the ways he envisioned. Thus the ways that the teaching multiplicities, or different amalgams of Mauro–students–context, came into composition and interacted to produce different kinds of practices. This speaks not only to the critical role that students may play in the construction of equity-based, learner-centered pedagogies but also to the importance of relationships (McDonald, Bowman, & Brayko, 2013), particularly when working with highly diverse students attending urban schools, who may be distrustful of the institution of schooling (Ogbu, 1982; Ogbu & Simmons, 1998). As teachers forge relationships with them, students may be more willing to trust teachers and take risks by participating in more learner-centered, complex activities.

Bruce's students served in a different, although no less important, role. Bruce was able to build productive student relationships by openly showing his trust and care for them. With these foundational relationships and the qualities of enthusiasm

and curiosity that students brought themselves, Bruce's students were always eager to participate in activities. Given the difficulties Bruce faced with his principal, a lack of resources and science equipment, and his own insecurities about teaching, his students' eagerness to participate may have provided a measure of support for him and contributed to the occasional appearance of elements of inquiry-based or experiential learning in his lessons. If he had interacted differently with his students, he might have abandoned his attempts to teach in equitable ways altogether, as many first-year teachers do when faced with pedagogical, personal, and/or organizational challenges (Allen, 2009; Saka et al., 2009).

### *Context Matters*

The evidence provided by these cases supports what many other researchers have also argued—that context matters in teaching (e.g., Hollins, 2011; Johnson, Kraft, & Papay, 2012; Matsko & Hammerness, 2014; Strom, 2015). We suggest that a rhizomatic perspective is fruitful for analyzing context as a fundamental part of teaching activity. Indeed, contextual elements may be, in some cases, more central participants in the shaping of teaching practices than the students themselves. Bruce's practices, for example, were profoundly influenced by his context. He began the year with many of the common contextual struggles that constrain new teachers—including a dysfunctional school organization (Scherff, 2008) and misalignment between his preservice learning and the pedagogical vision of the school leader (Brashier & Norris, 2008; Saka et al., 2009; Stanulis, Fallona, & Pearson, 2002). The way that these circumstances worked together contributed to Bruce's production of practices that varied between teacher-led and more collaborative problem-solving activities.

Like Bruce, Mauro was also affected by contextual circumstances, although perhaps not to the same degree. For instance, he felt more pressured to cover content in his classes because environmental science was tested in his district—another factor that tends to challenge new teachers (Brown, Bay-Borelli, & Scott, 2015). His earth science classes were untested, and as such, Mauro felt freer to be flexible in these classes and to respond to student needs as they arose. Without the pressure to follow a rigorous, prescribed content pacing guide, as he did in environmental science, Mauro was also more willing to pursue side conversations with students as they spontaneously made connections between content and their own lives. This, in turn, was an important factor in Mauro's ability to build relationships with his upperclassmen students, which helped gain their participation in more active lessons.

### *Implications for Teacher Preparation and Support*

The notion of students and context as agentic participants in constructing teaching practice speaks to a larger notion—the multiplistic, nonlinear nature of educator development and education itself. This perspective is a major paradigm shift away

from the teacher as an autonomous decision maker "in control" of her or his actions and student learning and, instead, moves toward a view of the teacher as just one element in a larger constellation. This constellation produces hybrid activity that is jointly produced by the mixture of elements interacting. This view means seeing the teacher *as* a multiplicity (a network of beliefs, preservice learning, experiences, personal qualities) *within* a multiplicity (a larger system of actors, discourses, contextual circumstances, etc.). Although, notably, this rhizomatic perspective is consistent with sociocultural theory and other participatory approaches to learning/teaching, it is a radical shift from the dominant view of individuals as rational, separate bodies with free will—a view that has only intensified in our current neoliberal era (Martin & Strom, 2015). In keeping with the theoretical foundation of multiplicity, we offer a systems-level view of implications for preparing teachers next.

Although the relationship of preservice teacher learning to eventual classroom practice is clearly nonlinear, that learning is one shaping element, and as such, initial teacher preparation has the potential to be a powerful influence in the negotiation processes that take place in the first year of teaching. Specifically, we suggest that teacher preparation programs might do so by more closely connecting preservice course work and clinical practice (Zeichner, 2010) and by helping future teachers to develop understandings of teaching as interpretive (Hollins, 2011, 2015) and relational (McDonald et al., 2013) work. More closely tying together initial teacher education coursework and classroom practice, a move that many preservice programs are making (Cochran-Smith et al., 2016), may aid in mediating the reality or "praxis" shock many teachers report experiencing as they encounter the difficulties of enacting their preprofessional learning amid the actuality of their new schools (e.g., Chubbuck, 2008; Chubbuck, Clift, Allard, & Quinlan, 2001). With extended opportunities to learn in, from, and for practice (Lampert, 2009), students of teaching can problematize the idealized notions of teaching that they develop from course work (Korthagen, Loughran, & Russell, 2006) as they experience recursive processes of learning about teaching and then translate those understandings into action with particular students, in specific school contexts, and within a certain policy landscape—the latter being what Hollins (2011, 2015) called *interpretive practice*. Finally, practice-based teacher preparation should also help teachers develop an understanding of the relational work of their profession, providing extended opportunities for teachers to experience and negotiate the agential role of students and contextual elements in shaping their teaching (McDonald et al., 2013).

An analysis of the experiences of Bruce and Mauro also raises a question regarding the support systems needed to help new teachers negotiate the complexity of being learners of a new craft at the same time that they must become teachers of students in their own classrooms. From our observations, there was a clear need for a support network with which teachers could connect to help them address pressing problems of practice while also allowing them to participate in continuous cycles of inquiry into their own practices (Taylor, Klein, Onore, Strom, & Abrams, 2016).

Such cycles of theorizing and practicing were available to these two teachers in their initial teacher education programs, but must also continue to be made available to teachers in their beginning years of teaching. An integral piece of these support systems includes offering new teachers induction mentoring as they navigate the constellation of personal, student, and contextual factors that continually shape their practices. Although Bruce and Mauro had mentors, they were scarcely mentioned in our interviews. Mauro's mentor taught a different area of science than he did, and his induction coach was a retired English teacher. 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. Thus their mentoring situations generally paralleled those found in the novice teacher literature in terms of mismatch and inconsistency (e.g., Castro, Kelly, & Shih, 2010; Fry, 2007; Stanulis et al., 2002).

Given that the first year of teaching is a period that profoundly influences teachers' practices as well as their decisions to remain in or leave the profession (Smith & Ingersoll, 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 specifically to help novice teachers translate their preservice learning into the realities of their new settings.

## Conclusion

In this article, we drew on the cases of Bruce and Mauro, two beginning secondary science teachers, to demonstrate the thoroughly nonlinear processes by which the two teachers constructed their first-year instruction. Throughout the article, we have argued that rhizomatics, a multiplistic theory of social activity, offers a radically different paradigm with which to analyze the fundamental hybridity of practices coproduced by teachers, their students, and their settings. This view of teaching moves us away from understanding teaching as a causal transaction between teacher and student, and toward one that is recursively negotiated between a constellation of factors. It also offers a more nuanced understanding of the fundamentally complex relationship between teacher learning and the enactment of that learning in practice—one that emphasizes difference over sameness. Although many researchers are focusing on the dynamic complexity of teaching and teacher development (e.g., Cochran-Smith et al., 2014; Opfer & Pedder, 2011), and teacher preparation programs generally support sociocultural understandings of student and teacher learning (Cochran-Smith et al., 2016), current conceptions of the *enactment of practice* still tend to echo a technical model whereby teachers

are expected to reproduce particular sets of instructional methods learned in their preparation programs (Sleeter, 2008). Yet, because each teacher–student–context multiplicity will come into composition and interact differently, such "fidelity" is impossible—and, we argue, sets new teachers up for failure, feeding the already heavily-swinging revolving door of novice educators. Teacher educators, school leaders, and other educational stakeholders must grapple with the notion that schooling activity produces hybridity—difference—and find ways to support new teachers as they negotiate these differences to construct equitable pedagogies.

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