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Understanding the Induction of a Science Teacher: The Interaction of Identity and Context

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Abstract

The demanding first years of teaching are a time when many teachers leave the teaching profession or discard the reform-minded practice emphasized in teacher preparation. If we are to lessen teacher attrition and more effectively support teachers during their development, a better understanding of what occurs during their induction into the profession is needed. The question that drove this research was what factors influence how a beginning science teacher negotiates entry into teaching? Specifically, we sought to understand how a beginning science teacher's identities interact with the teaching context, how this interactions shapes his use of reform minded teaching practice, and how the negotiation of identity, context and practice influence a novice teacher's employment decisions. The study involved two years of data collection; data included classroom and school observations, questionnaires, interviews, and teaching artifacts (such as lesson plans and assessments). The results demonstrate how conflicts in identities, institutional expectations, and personal dispositions of this novice influenced his transition in becoming a member of his school community. Implications of these interactions for teacher preparation and support are provided.

Understanding the induction of a science teacher: The interaction of identity and
context

The induction period, or initial years of teaching, is arguably one of the most difficult periods of a teacher's development and "deserve[s] some undivided attention" (Luft, 2007, p. 532). This is the time when novices strive to adapt ideas from teacher preparation programs to the realities of the classroom (Luft, 2007). For some teachers, the induction period is easily negotiated; others find it fraught with difficulties. The difficulties are evidenced by the large percentage of teachers who leave the profession during this induction period. Nine percent of new teachers do not complete their first year (Black, 2001), 14 percent leave after their first year (Ingersoll, 2002), approximately 30 percent leave the classroom within three years, and up to 50 percent leave within 5 years (Carver & Fieman-Nemser, 2009). This problem is even more pronounced for secondary science teachers, when compared to teachers of other secondary subjects as well as to elementary level teachers (Guarino, Sanitbãñez, & Daley, 2006; Ingersoll, 2006)

The research literature reveals that teachers deal with many difficulties during the induction period (Henry, Bastian, & Fortner, 2011). Common problems include discipline and classroom management, contextual contradictions, poor administrative support, limited resources, lack of time due to an overloaded schedule, loss of socialization opportunities, and contradictions between theory and practice (e.g. Luft & Patterson, 2002; Simmons, Emory, Carter, Coker, Finnegan, Crockett, ...Labuda, 1999). Until recently, much research on induction has emphasized cognitive processes (see Ingersoll, 2002; 2003 for overview) and has focused on the beliefs, knowledge, and skills needed to teach. However, other researchers, such as Simon, Campbell, Johnson, and Styliandiou (2011), have looked beyond cognitive factors and considered how the culture and context of the school impact science teacher induction.

A central strand of research into the development of novice science teachers focuses on the difficulties new teachers encounter as they attempt to work in reform-minded ways in contexts that may not be supportive of such efforts. The term “reform-minded”, which often appears in mathematics education literature (Wang & Odell, 2007), is intended to highlight the ways in which teachers’ thoughts about and approaches to instruction are central to efforts by organizations such as National Council of Teachers of Mathematics to change how mathematics is taught and learned. In science education in the United States, the varied reform efforts in science education coalesce around a number of central ideas:

- a) The goal of science education is to foster scientific literacy in students and to “prepare people to lead personally fulfilling and responsible lives” (AAAS, 1989, p xiii).
- b) Scientific literacy requires that students form a deep understanding of a limited number of foundational concepts as opposed to a superficial recognition of a wide range of scientific facts.
- c) Science concepts should be learned in relation to students’ everyday experiences so they can learn to apply their knowledge in those contexts.
- d) Science teachers must understand the knowledge students bring with them into the classroom and build from this knowledge in order to construct new scientific understandings.
- e) Inquiry is central to reform. Students should understand how scientific inquiries are conducted and how these processes shape the knowledge produced. A classroom incarnation of inquiry should be one of the fundamental means of science teaching.

Science education reform efforts in the United States parallel reform efforts in other countries. For example, educators in many countries emphasize the importance of teaching science in the context of students’ everyday lives (Schmidt, Raizen, Britton, Bianchi, & Wolfe, 1997).

Likewise, science educators from Australia, Lebanon, the United Kingdom, Israel, Venezuela, Taiwan, and the United States described the emphasis on inquiry as a ubiquitous feature of reform efforts (Abd-El-Khalick, Boujaoude, Duschl, Lederman, Mamlok-Naaman, Nias, Treagust, & Tuan, 2004). A reform-minded science teacher is one whose thinking and instructional practices are shaped by these tenets of reform. There is a growing body of literature that examines the difficulties reform-minded science teachers experience as they attempt to employ their instructional practices in contexts that are often designed around more traditional approaches to science teaching (McGinnis, Parker, & Graeber, 2004).

Documenting how teachers do (or do not) become reform-oriented practitioners requires examining a number of facets of a teacher's work. Becoming a teacher, especially one who is reform oriented, is much more complex than simply transitioning from preservice to inservice teacher. Settlage, Smith, & Ceglie (2009) suggest that "to be or become a teacher is a continual project of forming and reforming oneself within an intricate web of affiliation, institutional, discursive settings and natural elements" (p.105). Luehmann (2007) describes this process of "forming and reforming" oneself as identity development. Identity does not simply result from an accumulation of experiences; it is a "path that is created as the individual moves from one event or context to the next" (Settlage et al., 2009, p.105) and learns to position herself in ways that allow her to be recognized as a certain kind of person.

The cultural context of the school mediates a teacher's identity development (Luehmann, 2007) and identity, in turn, shapes a teacher's practices (Olitsky (2007a, 2007b). Culture, as described by Geertz (1973), is "an ordered system of meaning and symbols, in terms of which social interaction takes place....Culture is the fabric of meaning in terms of which human beings interpret their experience and guide their actions" (pp. 144-145). Similarly, Roth and Bowen (1995) describe culture as "the resources and practices of a given field" (p. 76). Cobern and

Aikenhead (1998) say, “we talk about a Western culture or an Oriental culture because members of these groups generally share a system of meaning and symbols for the purpose of social interaction” (p. 40). Teachers, too, share a system of meaning. There are norms and expectations associated with what it means to be a teacher and what it means to work within the context of a school. When we talk about the cultural context of school we are referring to the systems of meaning in place in a school, such as norms, expectations, ways of thinking and acting that characterize how people act and interact in this particular context. Examining the context is essential to understanding how the culture of the school shapes the teacher’s induction experience and how the induction experience influences a teacher’s decision to remain in the profession.

Research Question

The longitudinal study described here aligns with Luft’s (2007) call to study the contexts in which beginning teachers work and the development of teachers in those contexts. Building on Gee’s (2001) account of multiple representation of identity, we use Carlone and Johnson’s (2007) identity model to guide our analysis. The question framing the study was the following: what factors influence how a beginning science teacher negotiates entry into teaching? Specifically, we sought to understand how a beginning science teacher’s identities interacted with the teaching context, how this interactions shaped his use of reform-minded teaching practice, and how the negotiation of identity, context, and practice influenced his employment decisions.

Relevant Literature

The framework we used to examine novice teacher induction is identity. We selected this framework because becoming a teacher is an idiosyncratic process that takes place within the cultural context of schools (Bullough, 1992) and the construct of identity allows researchers to

attend to the ways in which personal dimensions associated with becoming a teacher, along with the school context, influence a novice's professional identity. This construct helps researchers examine the dialectical and mutually constitutive relationship between the teacher as a person and the school as a community, as well as how a person's past experiences and a community's history shape the activities taking place in a given context. Therefore, identity can be an important theoretical tool for understanding schools and society and serves as a means by which individuals understand and act upon their environments (Giddens, 1991).

Teacher Identity

Several studies focus on novice teachers' identity development in the context of science teaching and its interaction with personal history (Smith, 2005) and more formal learning experiences (Eick & Reeds, 2002), including preservice reform-based experiences (Luehmann, 2007). Adams and Krockover (1997) focused on four secondary beginning science teachers' induction experiences. Using the *Secondary Science Teachers Analysis Matrix* developed by Gallagher and Parker (1995), they found that personal histories of beginning science teachers play a significant role in shaping their identities as teachers. Eick and Reed (2002) illustrated a strong relationship between beginning teachers' identity development and their preservice experiences. Using personal histories as a lens to understand beginning science teachers' identity development the authors illustrate that preservice experiences helped teachers envision themselves as inquiry-oriented teachers. Other research reveals that many first-year teachers experience fundamental identity conflicts as they work to resolve their expectations with current teaching realities and merge their personal experiences with their professional identities (Varelas, House, & Wenzel, 2005).

Although personal characteristics play a role in shaping a teacher's identity, it is also important to consider the context in which the teacher works. In previous research, we (Authors,

2009) have described how novice teachers constantly learn as they work within the culture of a school and participate in activities with more experienced members of the school. Appleton and Kindt (2002) found that teachers' identity development was strongly influenced by their experiences as teachers in schools and classrooms. With respect to teacher induction, the beginning years of teaching are often marked by demanding, identity work, providing a rich context in which to consider how beginning teachers continuously negotiate new identities and self-understandings (Olsen, 2008). Varelas et al. (2005) found that beginning teachers experienced contradictions while forming multiple identities. They argue, however, that the contradictions beginning science teachers experience are not inherently problematic. In fact, such contradictions are seen to be opportunities for teachers to explicitly address, discuss, and debate the validity, value, and implications of such opposites. Both Olsen (2008) and Varelas et al. (2005) urge teacher educators to attend to the challenges associated with learning to teach by helping beginning teachers understand that identity conflicts and challenges are something to be expected by most beginning teachers and that teacher identity construction is essential for novice teachers' professional development.

In addition to revealing factors that impact becoming a teacher, identity provides a way of viewing the process of learning as the socialization of individuals into the norms and discourse of science (Varelas et al., 2005) and into the culture of the school. By way of participation, novices become members of a particular school community by learning essential knowledge and skills as well as developing appropriate roles in relation to members of the school community. Through this process, novices form new identities that are necessarily bound up with new knowledge and skills. Thus, forming identities is a social process that takes place within a culture, and becoming more knowledgeably skilled is an aspect of participation in social practice.

Carlone and Webb (2006) describe that teacher identity and individual identity often interact to play a significant role in shaping teachers' actions within an activity system that includes individual, social, and institutional influences. Luehmann (2007) suggests that beginning science teachers' induction experiences could be better understood and supported by focusing on the process of *developing a new professional identity* as a "reform-minded science teacher"—a professional identity (similar to Gee's [2001] institutional identity) often seemingly irrelevant within the norms of accountability as described by Cochran-Smith (1991). In a qualitative case study, Upadhyay (2009) explored an elementary teacher's identities and the influence of identity maintenance on science teaching in a challenging school context. He found that a teacher's identities generate tensions while teaching science when the school prioritizes high-stakes tests as the benchmark of teacher and student success. Due to such prioritizing, the teacher felt obligated to make choices to support her students' schooling, create positive teacher identities, and positive social identities, and to avoid conflicts with the administration.

The findings from these studies highlight the centrality of context in shaping and re-shaping teachers' identities, thus prompting researchers to consider not only who the teacher is but also how the cultural context in which she participates shapes her identity.

Identity as Socially Enacted

In this research, we understand identity to be social in nature because it requires purposeful action to gain recognition from others. Said differently, when examining identity it is necessary to consider the practices in which a person participates and how others react to that participation (Kozoll & Osborne, 2003). If a person is not recognized as enacting a particular identity then his or her actions are likely to be dismissed by members of the community. For example, a teacher who does not demonstrate a willingness to work with students may not be recognized as a teacher and students may refuse to engage productively in class activities.

Each of us enacts multiple identities relevant to the different roles we play in our lives; identity formation and maintenance are dynamic processes that involve an individual interacting with others within particular contexts. Too, identity is socially negotiated through discursive activities with others; an individual cannot perform an identity without some form of recognition from others. As explained by Carlone and Johnson (2007), “One cannot pull off being a particular kind of person (enacting a particular identity) unless one makes visible to (performs for) others one’s competence in relevant practices, and, in response, others recognize one’s performance as credible” (p.1190). This particular “take” on identity, which stems from Gee’s (1990) work in social linguistics, is useful for understanding one’s group membership. It focuses on Discourses (ways of “saying-doing-being-valuing-believing”) as an “identity kit” and how these Discourses shape the way an individual acts in order to be recognized by others as having a particular social role (Gee, 1990, p. 142).

We selected Gee’s socially enacted approach to understanding identity as the theoretical frame to understand the novice at the center of this research because much of the work of a new teacher involves learning how to enact particular practices in order to be perceived as a competent member of a school community. Further, this framework allows us to explore difficulties new teachers have in deciding which identity is most appropriate to enact within the often new and confusing contexts that classrooms and schools often present.

Methods

This two-year longitudinal study employed an interpretative case study design (Creswell, 1994) and explored the experiences of one reform-minded science teacher from the outset of his career throughout his first year in teaching.

Participant

This study focused on a reform-minded beginning science teacher. The teacher education program he was enrolled in featured concepts drawn from the reform efforts as described by the American Association for the Advancement of Science (1989) and the National Research Council (1996, 2000). Nathan (pseudonyms for the participant and his school are used throughout) had strong content preparation in physics, was engaged and knowledgeable about science education reform efforts, experienced some success teaching in reform-minded ways during his preservice internships, and continued this work in the same district for his first year of teaching. Nathan was white and from middle-class home with family that valued education. In this last regard he was similar to many graduates of secondary science programs.

Nathan was chosen for this research because he was one of the most reform-minded, promising science teacher candidates emerging from the local teacher education program in recent history (as judged by the program's instructors). This assessment was confirmed by a review of his teaching philosophy and personal statements. We purposefully selected a participant who was very open to discussions of his practice and one who deliberately chose a very difficult setting for his induction year. By collecting data while Nathan completed his university preparation, we were able to understand his reform-based preservice experiences. By exploring his first year teaching context-- Nathan was at a very individualistic, urban high school-- we were able to understand how the culture and context of the school influenced his identity development as well as how these identities shaped his enactment of reform-based science teaching.

The researchers had a long-term relationship with Nathan. The first author, who conducted the vast bulk of the data collection, had taken courses with the participant the year prior to the study and had participated in student professional organizations with him. The

second author had been his instructor in two methods courses prior to student teaching. This familiarity allowed insight into the selection of participant and greater ease in data collection for some aspects of the study, although it also posed other problems as in terms of access to the classroom as the school year progressed and as the data were analyzed, and as the researchers' expectations for Nathan and the realities of his classroom were found to be starkly different. The third and fourth authors reviewed the research process and provided in-depth critical insights with respect to research methodology, data analysis and discussion.

Data Collection

The research began during the spring before Nathan's first year of teaching and continued in the semester following this year. Given the broad scope of Gee's (2001) framework, data collection was extensive and included questionnaires, semi-structured interviews (with the participant and his coworkers, administrators, and professors), classroom observations and other observations at the school site, and document analysis (see Table 1). We attended to Gee's point that "through language [that we] enact a specific social identity" (2001, p. 4). Therefore, the novice at the center of this research was considered to be constructing, transforming or refining his multiple identities in relation to his first year context.

Insert Table 1 about here

The interviews and Nathan's teaching philosophy were used to understand the thoughts, beliefs, and views in informing his identities and teaching. The myriad observations, interviews with colleagues and administrators, and classroom artifacts (i.e., notes from administrators, websites) revealed additional insights into aspects of the first year of Nathan's teaching. Data collection specifically focusing on teaching, document analysis of lesson plans, classroom artifacts and teaching interviews allowed us to understand the participant's teaching practices and his thoughts about these practices.

Data Analysis

As a way to approach the data we began the analysis using Gee (2001) analytical framework with his description of four different positions from which one's identity is constructed:

- Institution identity* is a position authorized by authorities within an institution. This form of identity has to do with higher authority and personal efforts contributing to being recognized as a member of a particular institution. Simply, institution identity is a position and can be stated as "She is a teacher at Lake Middle School."
- Discourse identity* is an individual trait that can be recognized through discourse and dialogue among individuals. The source of power for this position is the recognition occurs among individuals. An example of this identity is "She is an effective teacher."
- Affinity identity* is composed of sets of distinctive practices within a group, and the source of this identity is distinctive social practices found in members of a group. A representation of this identity can be "She is an environmentalist."
- Nature identity* is a position developed from forces in nature. The nature identity can be as simple as "She is a female." The interactions of nature identities in these levels always collapses into other identities.

As a way to understanding the nature of the identity enacted in these positions we used Carlone and Johnson's (2007) more focused framework of three interrelated and overlapping dimensions of identity: competence, performance, and recognition. A science teacher is expected to follow her school's prescribed norms and demonstrate that she as a teacher acts in certain ways for other school members to recognize her performance as appropriate if she wants to be considered a teacher of that school. Working within Carlone and Johnson's framework, we focused on the participant's performance in the classroom and with others, as a teachers'

performance plays a significant role in identifying relevant teaching practice. Recognition on the other hand, provides empirical bases for the teacher to recognize herself and be recognized by others as an effective teacher. Being less publicly visible than performance, the competency dimension identifies her level of pedagogical and content knowledge relevant to her teaching area.

We used analytic induction (Bogdan & Biklen, 2006) and the constant comparative method for analysis (Strauss & Corbin, 1998). Analytic induction began by sorting data into categories based on the conceptual organizers utilized in Gee's (2001) framework of 4 positions of identity: nature identity, institution identity, discourse identity, affinity identity. In essence, these preliminary categories guided our work in the open coding stage in that it helped us generate codes within each category—although institution identity and affinity identity proved to be the positions that most frequently emerged from the data. We then reviewed data within each of these broad categories to develop a rich understanding of what these concepts meant in the case of this teacher (Bogdan & Biklen, 2006) before turning attention to aspects of the theory. We then applied Carlone and Johnson's framework to flesh out different ways in which these positions of identity were enacted by the participant during stage two coding, that is the development of axial codes, that calls for identification of commonalities and differences in each category. By assigning categories into progressively more inclusive groupings we focused on this teacher's implementation of science education reform, accountability measures, and his attempts to be perceived as a competent member of his school community.

After identifying axial codes, we explored our case further by collecting further data and generating specific codes, which is stage three of Strauss and Corbin's procedure. The themes discussed in this article were the result of this final stage of data analysis in which we examined relationships and contradictions between codes in different categories. An example of selective

coding included Nathan's personal need for perceived competence negating the department's support networks. Data collection and data analysis were initially carried out concurrently, and once saturation was reached, data collection was halted, while data analysis and case analysis continued.

Trustworthiness

We conducted systematic and ongoing member checks with Nathan, other teachers and administrators throughout the duration of the study (Silverman, 2006). In addition to these efforts, Nathan provided input on various drafts of this manuscript, including the final draft, with the invitation to challenge and further our understanding of his first year experiences. During these checks, the participants offered their assessment of the soundness of the researchers' interpretations.

Given the nature of the description that follows, it is important to note that in nearly every instance of member checking with Nathan, he urged the researchers to explore and further refine the themes that were presented. At no point did Nathan suggest that our descriptions of his classroom performance were flawed or that our analyses were incorrect. Instead, his comments caused us to more pointedly analyze the data, identifying instances in which our descriptions could be enriched by other sources or when our analyses were incomplete. In such cases, we returned to the data and our coding to further flesh out our evolving explanations. For instance, we originally underestimated the impact of Nathan's negative interaction with his administrators. After discussions with Nathan we returned to our notes and looked for evidence of the importance of this interaction in shaping his interactions with his colleagues and his students. Thus, the findings presented in this article are consistent with both researchers' interpretations and the participant's perspectives. Further, as we collected multiple forms of data, we engaged in ongoing triangulation in that as new data and/or analyses emerged, we sought to find evidence of

these trends as extant in more than one data source (Bogdan & Biklen, 2006).

Findings

In this section, we present a case study of Nathan, a novice teacher who selected a very challenging school for his first year, to explore how a beginning science teacher negotiates his induction into the teaching.

Introducing Nathan

Nathan completed his teacher education program with an emphasis on physics education. During his coursework and fieldwork associated with the program, he was engaged and met challenges with deep thought and high energy. Nathan spoke quickly and almost always with humor, engaging everyone around him in conversation. During his teacher preparation, it was clear that Nathan recognized the potential power of teaching, and during his preservice preparation he decided that he wanted to teach a group of students who needed his support and for whom his efforts could be *transformative*. He wanted to teach *science for all*, and felt that underserved students deserved well-prepared, passionate teachers. Based on his successful student teaching experience at Kent High School, Nathan chose this school as the site for his first year of teaching. He thought that he could make “more of a difference at Kent High School” even though he recognized that teaching at Kent would require he spend some time teaching out of his field of physics.

A Difficult Context: Kent High School

Kent High School was one of the six 9-12 comprehensive public high schools in the district. At the time of this study, Kent had 1239 students (41 % White, 52% Black, and 7% classified as Other; 41% of student population received a free and reduced lunch). Kent High School had a higher percentage of the student population living in poverty than any other high school in the district.

There was a very low teacher turnover at Kent High School. Over 73% of the teachers had more than 10 years experience, and 50% of those teachers spent a minimum of 10 years at Kent. However, over the last few years the school was known for “losing” its new science teachers. Before Nathan, the science department lost six science teachers after their first year of teaching.

In terms of student achievement, Kent High School received a grade of “D” in state achievement test administration for three years in a row, by far the lowest school “grade” for any of the 6 high schools in the district. Because of the school’s continuing underachievement, the district mandated that school administration prepare an improvement plan. Much of the report highlighted monetary contradictions that the school faced as well as plans specific to improvement on the state mandated achievement tests. Some steps were taken to try to improve the achievement, for instance in all classes teachers were required to devote time to reading and mathematics practice sessions as these were the disciplines accountability measures emphasized.

In order to build community relationships, Kent High School communicated with parents via the school website and the parent listserv. In addition, Kent High School published a parent newsletter four times a year (N, A7). For special events, administrators called parents to invite them individually. Despite these efforts, it was apparent that parental involvement was very limited. At the beginning of Nathan’s induction school year, the school organized a ‘back to school night’. Only three parents attended Nathan’s section (N, O2).

School administrators often focused on accountability requirements in mathematics, reading and writing, creating a tension between administrators and teachers. Teachers in the science department were critical of administrators’ emphases on math and reading scores, criticism that was magnified in the face of the administration’s reluctance to improve the science department via structural changes (e.g., materials and equipment). Additionally, these teachers

were often critical of their administrators' sole emphasis on accountability measures and a marked de-emphasis on behavior management for students. Aside from ensuring that students read or completed mathematics warm-ups during the first 15 minutes of every class, administrators were largely absent from the hallways of the school. Indeed, during the year at Kent we failed to see the principal at all. Although the administration approved this research, our persistent requests for an interview were not met with any sort of response.

Nathan's Teaching during His First Year in Kent High

Nathan had been placed at Kent for his student teaching, and based on this experience he chose it as the site of his first year of teaching. His positive experiences with students during student teaching sparked his interest in working with students with from low socioeconomic backgrounds, as he felt that he could have an important influence on those who had limited resources. When Nathan began teaching, his primary goal was to inspire his students to develop a "global understanding" of science (N, A1). He intended to use many of the practices described in science education reform documents that he explored during his teacher preparation program, including basing instruction on students' incoming understandings, using inquiry-based activities followed by discussions, and using nontraditional means of assessments such as concept maps. Despite these intentions, soon into his first semester of teaching, it became clear that Nathan's first year was going to be particularly challenging. Looking back, Nathan noted "I had considerably larger challenges than other first-year teachers" (N, Jun. 06).

Kent High School used a block schedule; there were four 90-minute lessons in a regular day. The classes started at 7:25 and the school day ended at 1:35. Nathan arrived to the school half an hour early and typically spent this time talking with students and receptionists. Nathan also typically spent his one planning period in conversation with students or office staff (N, O1). In a regular day, he left the school around 2:00 p.m. and went to a coffee shop to work on

assignments for his graduate classes as well as attending to teaching tasks such as grading papers or planning lessons.

Nathan had different teaching responsibilities during each semester. In the first semester he was responsible for teaching three 9th grade Earth Science classes, although he was certified in physics. In his second semester, Nathan continued with two earth science classes and added one astronomy class and “lunch duty” that required him to be present in the student cafeteria (N, O7). Surprisingly, Nathan welcomed lunch duty as an opportunity to further connect with his students. He spent this time talking and joking with a variety of students. Given the number of students around him, it was evident that many of his students enjoyed his company (N, O7). In addition to teaching and lunch duty Nathan was required to participate in the district’s first-year teachers program. In Nathan’s view, the district’s requirement was a formality that drained valuable time but failed to provide support or guidance.

Nathan began his first year of teaching emphasizing the nature of science, which is something he understood to be “central to the reform in science education” (N, Sep. 05). Using explicit, reflective, activity-based lessons, Nathan described these activities as means to enhance student interest and excitement toward learning science. However, as he implemented the lessons that he had planned during his teacher education program, he modified them to include demonstrations augmented by triadic dialogues, moving away from student-centered activities that were planned (N, O2, and O3).

After the introductory nature of science unit, it became clear that Nathan had difficulty using the long 90-minute periods effectively. He began to employ more and more lectures, and Nathan explained that he simply did not know enough Earth Science to sustain a 90-minute lecture. As a result, he moved to lecturing or “discussing” via a triadic dialogue for 30-40 minutes, followed by bookwork and time for social discussion. In order to engage his students

during this time after the lecture, he often talked about daily life issues or social and political issues in his class (N, O5). Because of the way he employed the block schedule he could not see it as potentially enabling student-centered exploration of material. Instead, Nathan considered the block schedule one of the factors preventing him from achieving his lofty teaching goal of moving his students toward a “global understanding.” Although he recognized this difficulty as he progressed through the school year, he saw no possible alternatives to his reliance on lecture and he explained that he had to simply continue on as he had been practicing.

Nathan’s inability to conceive of alternative teaching approaches was curious. Although his formal responsibilities were no greater than any other first-year teachers in this district, time constraints seemed almost an overwhelming challenge for Nathan. It is important to note that Nathan was pursuing a graduate degree during this first year of teaching, and his graduate school responsibilities dominated much of his personal time. As a first-year teacher, he said “Little did I know how difficult it is to be an effective science teacher and a successful graduate student at the same time” (N, Nov. 05). He stated, “I don’t wanna fail my [graduate] class, OK! But it is hard finding the time for both two... But what happens is that I get home I feel so tired and I am like, you know forget it!” (N, Nov. 05).

Perhaps because of the time Nathan devoted to his graduate work, he did not have time to prepare effective activities and lessons or look for alternative ways to facilitate his students’ learning. Toward the end of his first semester it became clear Nathan often taught with almost no formal or informal planning or preparation (N, A3, O3, and O4), a lack of planning that forced the use of lectures and bookwork. Nathan was aware that lecture-based science teaching was in stark contrast to his personal teaching philosophy. Nathan noted “There are days, I question whether I’m teaching for their [students] needs” (N, Jan. 06). While his master’s program enriched his understanding of the reform efforts, Nathan did not attempt to enact these

understandings in his own classroom-- largely because he found the conditions in his particular situation to be too overwhelming. This may be because the courses he was taking at the time were not focused on pedagogical approaches to teaching science or students' learning of science. Nathan had finished most of these courses prior to the beginning of the school year. During the year, he was engaged in coursework not directly related to science teaching and learning.

Nathan argued that the shift in his teaching practice from student centered to teacher centered was due to the extraordinary contextual barriers he faced, including the cognitive and skill levels of his students and his limited content knowledge because he was teaching out of field. Nathan explained that he needed to provide the "structure" for his students and he was forced to cover content—both of which from his perspective pointed to the need for lectures. Additionally, this assertion was based on his beliefs about what his students needed within the context of No Child Left Behind (NCLB) accountability (N, A1).

By the second semester, it became clear to Nathan and the researchers that the combination of heavily lecture-oriented teaching combined with post-lecture socializing was not effective, something that was most obvious in terms of classroom management. The lectures resulted in lack of student interest, spiraling to a crisis of management in his classes as students began side discussions, used cell phones, and generally failed to engage in interactions with Nathan (N, O3, and O4) (i.e., whole class discussions of sports, triadic dialogues regarding course material). In his rare use of laboratory activities or demonstrations, Nathan became more convinced that his students were not "capable of learning in laboratory because they failed to behave" in ways that he found appropriate (N, Nov. 05). These students resisted participation in the laboratory (i.e., they failed to follow directions he provided, actively listen to his directions, or complete the task assigned). Nathan argued that student misbehavior "pushed" him to rely solely on lecture, notes, and worksheets to provide the "structure" that he felt his students

needed. These less student-centered activities required less student involvement to carry out on his part, so students' lack of engagement in the teaching practices he employed did not stop the class "cold"(N, O4, and O9).

Nathan's First Year Identity

In this section, we focus on Nathan's identity to understand the depth and severity of his difficulties, as well as the negative feelings that became quickly evident during his first year of teaching. Two affinity identities Nathan enacted during his preservice preparation were that of a self-sufficient, successful teacher and reform-minded, critical practitioner; at the university these identities were well received. His college professor and graduate advisor referred him "being an outstanding student and a person who was often called upon to offer his opinion" in class discussions (A, Jun. 06). During his preservice years, such external validation and positive recognition were important and motivational for Nathan.

Discourse identity of idealistic friend and champion of students.

Nathan started his first year with a mindset that his participation in the Kent High School community was an opportunity for him to put his ideals into practice and to "make a difference" in underserved students' lives (N, Sep. 05). During his early days at Kent, Nathan worked to maintain an identity that was distinct from that of other teachers. He worked to perform an idealistic, friend and champion of the student identity to structure a strong sense of rapport with his students, and this was eased because he was relatively young and energetic and his students were comfortable talking with him. He explained, "They like coming to my class. I make them believe in themselves" (N, Sept. 05). Nathan also stressed that his students were aware of his feelings about them. He described, "I care [about them] and they know that I care. They see it in my face" (N, Sept. 05). Nathan noted, "On my free time I hang out with my students. I don't

hang out with other teachers.” To maintain rapport with his students, he participated in his students’ activities and went to “their games and support[ed] them” (N, Dec. 05). Nathan noted:

[T]hey come to me. I have a group of like 10 students come to eat lunch in my room because they do, they like hanging out in my room. You know, I talk around with my students, I ask them how their personal lives are. They give me pictures. You know that goes such a long way. (N, Sep. 05)

Because Nathan placed importance on this identity as champion of the student, he spent more of his time maintaining rapport and student communication than focusing on teaching science.

Nathan became popular among Kent High School students. At the beginning of the semester, thirty-three students enrolled in this elective science class. Nathan explained, “Students flocked to me. They want to be in my class. Not because they want to take science, because they wanna be in my class” (N, Feb. 06). His relaxed, informal classroom culture was compelling for the students, and their positive reactions were very motivational for Nathan supporting this friend to the student identity.

In return for his strong interest in students, Nathan gained a deep sense of loyalty from students, which provided him with external validation and positive student recognition during the early part of the year. His students’ strong sense of loyalty was apparent during administrators’ observations of his class. While Nathan often had management problems during teaching, students behaved flawlessly when an administrator came to the class (N, O6). In Nathan’s view, this was evidence that his students valued him; they were loyal to him and sought to protect him from his superiors. For Nathan, the “us versus them” was he and the students against the other adults in the school. While students viewed other teachers as “old and they’re just pissed off,” (N, Feb. 06) Nathan explained that “[students] realize that I’m on their side” (N, Feb. 06).

Nathan explained:

I think my personality is more important than how good of a teacher I am. I can be the worst teacher but because my kids like me because they feel safe in my class, because they think that you know I'm working for them as opposed to against them (N, Feb. 06).

Institutional identity of a novice teacher.

Nathan opted to teach at Kent High School to make changes; he wanted to “fight their fights” (N, June 06). He entered his first year understanding it to consist of a fight for “freeing” the entire school from its historical position of underachievement. Based on his positive student teaching experiences at this school during student teaching, he expected a very supportive administration. However, in performing this “idealistic” aspect of this champion of the student identity, Nathan openly expressed his opinions about the school policies at faculty meetings because he believed the administration hired him for his insights. However, Nathan quickly came to understand that the school community recognized him only as a novice who should remain silent and carry out the school rules and values. The portraits of the appropriate affinity identity for a first-year teacher were in stark contrast to Nathan's own professional identity.

Indeed, Nathan described a series of tensions growing between him and the school administration beginning with his first days at the school. In the third week of Nathan's employment, the school administration called a faculty meeting to discuss the ongoing implementation of a mandate to devote 10 minutes to a math “warm up” provided to the teachers every day in each class period. While he followed the directive to implement this warm up, Nathan was very critical of the proposal. He said, “Our students are becoming frustrated with this [rote material]. They are tired of being handed this implicit message of inadequacy” (N, Nov. 05). The reaction of the administration to Nathan's comments was very intense and harsh. He noted, “...we went to this meeting and I poured my heart out to my administrator and I was told not to come back next year” (N, Nov. 05). In fact, after his comments an administrator

reminded Nathan that he was not being “forced” to work at Kent and suggested to the entire faculty than any individual not wanting to face the challenges as Kent should look for a new school the following year, both of which Nathan perceived as a direct threat to his future employment.

Nathan was very distressed by this interaction, and his distress was evident to other teachers at the meeting. Nathan’s department chair called him later that evening and asked him if he planned to continue teaching at Kent. The next day at school, Nathan was called to a second administrator’s office to discuss his comments during the faculty meeting. During this session, Nathan recalled that the administration took no responsibility for this very negative interchange. After this interaction, Nathan went to school every day for a month thinking “Maybe I am gonna lose my job” (N, Nov. 05). This extreme contradiction elicited an emotional response for Nathan that he “will never forget”—in response he became angry and frightened (N, Jun. 06). It is important to note that early on the researchers failed to understand the importance of this incident to Nathan, and indeed it was not until he reviewed drafts of this manuscript that the research team came to understand the depths of its impact.

Affinity identity: Effective, self-sufficient reform-minded practitioner.

During his teacher preparation program, his college professor described Nathan as working to perform the identity of “an effective, self-sufficient teacher” and “in classes and his teaching internship he seldom sought input on his lesson plans, although he was quick to help others refine their own” (A, Jun, 06). He brought this identity to Kent.

I think my [science] department as a whole knew that I didn’t need their help unless I really asked for it. But I was pretty confident, pretty much knew what I wanted to do and how I wanted to handle things. So, they needed to be hands off (N, Jun. 06).

Because of this self-sufficient identity, Nathan did not work to become assimilated into the professional culture of the school. He came to departmental lunch meetings only to share stories and jokes (N, O8). His early clash with the administration made Nathan recognize that he was not valued by the administration. The silence of his science colleagues during and after this negative exchange with administration caused Nathan to withdraw even further from the professional community at Kent. He did not take advantage of the district's mentoring system, nor did he turn to his department head to solicit teaching advice, even after it became obvious that his classroom management was going awry. Although he approached his department head for the occasional test question, these talks were ones in which Nathan, the self-sufficient, successful teacher, did not solicit help. His department head, Mr. Clair, said of Nathan: "He likes to talk. But not everybody likes to listen. You know I think that created part of his complex problems" (C, May. 06). Indeed, during this period, Nathan took great care not to discuss these difficulties in his graduate studies or with his mentors at the university. Because of his need to maintain the identity as an effective, self-sufficient teacher, many of the resources of the school (materials, activities, equipment) remained unknown to Nathan. Mr. Clair pointed out "We have boxes of student activities and lab activities to do in earth sciences and he probably, well I don't think [Nathan] really used those much of the year" (C, May. 06).

During his teacher preparation program, Nathan also took up the identity of a reform-minded practitioner, one who sought to teach science to ALL students and was willing to employ nontraditional practices to allow students to develop a 'global understanding' of science (N, A1). This identity was supported and applauded during his coursework and fieldwork included in teacher preparation program and during his graduate coursework. According to his university professor, Nathan was "hardworking, articulate, critical, and quick to embrace new ideas and convincingly denounce current practices and conditions" (A, Jun. 06). This identity of a reform-

minded practitioner “fit” very well in a reform-based teacher education program, and Nathan was used to and sought the “perks” of this privileged status--such as long philosophical talks with professors, “room” to voice his opinions in methods classes, high marks on his critical papers, and encouragement to engage in graduate coursework. At Kent, Nathan’s identity as friend and champion of students appeared to be more important to him and his students than his “actual ability as a teacher” (his reform minded practitioner identity) (N, Feb. 06) as he understood a good rapport to be essential if students are to learn. Unfortunately, Nathan’s identity as friend and champion of the student prevented him from following any sort of classroom rules (N, A3) so the result of his focusing on this idealistic champion identity soon became apparent. After the initial student-centered nature of science unit, the lectures and worksheets he used were uninteresting to students, making his lack of classroom management debilitating as idle students began to act out in inappropriate ways and refused to participate in discussions or attend during lectures (N, O4, O5).

By the end of the school year, it became apparent that Nathan’s affinity identity of reform-minded practitioner was not only silenced but was undergoing a transition. His initial goals of teaching science to all were being abandoned. By year’s end, he described his teaching as effective with “smart kids” and he noted, “I can’t teach lower level kids. But I know in my, just daily vocabulary [that] things that I say will go over their head. [So] some of the meaning of what I’m saying is kinda missed” (N, Jun. 06). Thus, his early goal of teaching science for ALL had been revised to teaching science to a select group of more capable students.

Interactions of Nathan’s Identity and Teaching

Soon after the early clash with administrators, Nathan’s idealistic drive to be a transformative teacher was replaced by concern for professional “survival.” He explained, “[the school administration] wanted to fire me for the entire month of September. And coming to work

every day was miserable because I walked on eggshells for a month, a month and a half” (N, Jun. 06). During this time, rather than working to be perceived as a reform-minded practitioner with his colleagues, he switched his attention to simply holding onto this job. He explained:

I’ll never be the teacher that I was. I’ll never view it the way I did it a year ago. It was exciting you know. I love reading my teaching philosophy. And I would never make any changes to that but I don’t think that I can write that anymore with the realities of what I’ve received this year. And that’s sad. And it’s taking me a long time to get as close as I am to that. I don’t wanna write another one [teaching philosophy] because what I wrote was wonderful, was great. But I know that if I had to write one now, I could not reproduce that (N, Jun. 06).

Clearly, survival concerns shaped his emotional state. In turn, these negative feelings influenced his teaching practices, from socialization with community members to classroom practices.

The impact of his negative feelings was most easily seen during Nathan’s efforts in his “4th block” class. What began as a difficult class to manage became a class that Nathan lost interest in and lowered expectations for: “Well, the 4th block is still off the wall. I don’t enjoy that class... I don’t enjoy teaching them...I don’t perceive the majority of my students are having an interest in school” (N, Feb. 06). Because of student misbehavior during his class, Nathan explained that his fourth period students “deserved” only a “college style course” where he lectured for 25 minutes and “they come in, they do book work or they take notes. That is what they do. They do a work sheet then we take a test. That is all” (N, Jan. 06).

The students’ obvious resistance to Nathan’s early attempts to engage them and their resistance to show solidarity with Nathan’s efforts resulted in a very negative reaction on Nathan’s part. He withdrew his investment in this group of students as they rejected his identity as friend and champion of the student. Nathan “cut them off”, meaning he lowered his

expectations of them and acted on these low expectations. This began a negative spiral. His negative perceptions and low expectations caused students to withdraw further from this teaching and increased management crises. Nathan explained, “That is a class that goes all alone. I have no control over them at all. And I very much dislike this class. And I approach it very differently” (N, Jan. 06).

Although Nathan continued to perform a self-sufficient teacher identity with his school colleagues, he reacted in negative terms when he realized they failed to recognize him as a full-fledged member and instead viewed him as a novice (evidenced by the expectation that he be quiet in faculty meetings). Nathan’s negative feelings caused him to be even less receptive to formal sources of support, such as the mentor teacher assigned to him by school administration (who left the school mid-year for another assignment). Other teachers in the school, especially his department head, attempted to help Nathan design lesson plans and activities for his Earth Science class. However, Nathan was reluctant to accept their assistance. Mr. Clair described him as “being self-sufficient and looking down the road to his professional career” (C, May. 06).

Based on his first semester experiences, Nathan realized that it takes many things to be an effective science teacher. He indicated that his preservice education provided him with sufficient preparation to teach science. However, he also described the importance of teaching context. He noted, “You can know how to be a great science teacher but you also need to be in the right situation” (N, Dec. 05). Evidently, he thought that Kent High School was not the right context for him to achieve his teaching goals, and he explained:

I know how to be a good science teacher...but I am not in the situation that allows my abilities, my natural abilities to come into play...I am better with higher level kids.

Things I wanna do, I cannot do with these kids. I enjoy reading and asking them some of

these more esoteric questions. How does this impact our lives? ... And they're not able to make those deeper connections... (N, Dec. 05).

This is in stark contrast with his goal of teaching "science for all" that he held at the outset of the school year.

During his second semester at Kent High School, Nathan began searching for other teaching positions for the following year. Although the Kent administration offered to reappoint Nathan to his position, he became a *mover* (Smith & Ingersoll, 2004) since he believed that the Kent High School community would never recognize him as an excellent science teacher. The prospect of his students' scores on the upcoming standardized assessment magnified this fear because he was sure his students would not perform adequately. Nathan devoted a great deal of his time to his Master's studies (where he could perform the identities of reform minded practitioner and effective, self-sufficient teacher) rather than his teaching practices during his first year in teaching. Perhaps the university provided Nathan with the validation he sought, while the school failed to do so. This made his decision to leave the district and continue teaching elsewhere in the short-term and to eventually leave the classroom to pursue an advanced degree clear cut. According to Nathan, he was interested in pursuing a doctoral degree to "put him in a position" to provide useful support and resources for future novice teachers so that they could avoid the difficulties he experienced in his first year.

At the end of the school year, Nathan did leave the school, and he found employment in another high-needs school in another part of the country. Although this period is out of the timeframe of this two-year study, Nathan reported that he was far more successful in this second teaching placement. After leaving Kent, Nathan took a teaching position at a high school in a large urban district in the western part of the country. Once again, he selected a high-needs school and this new school served largely low income Hispanic and African American students.

Here, Nathan achieved the success with students he sought. His students consistently passed the state science test that was administered in both 10th and 11th grades. Indeed, his students' passing rate was the highest among the science teachers at his new school.

Unlike his year at Kent High, at his second teaching placement, Nathan felt appreciated by his school administration and considered himself a valuable part of the school community. Nathan felt that his principal trusted him, and as evidence he was given freedom to discard the district-mandated curriculum and use a more reform-oriented curriculum than that offered by the district. After his first year at the new school, Nathan's school underwent a small schools reform, and Nathan was offered a leadership position within his smaller school. While Nathan was originally hired to teach chemistry and physics, by his second year he was also assigned an Advanced Placement Physics course.

In the short-term, Nathan's teacher preparation program and the supports available in his teaching context were insufficient to supply the guidance he needed during this first year, thus he became a "leaver" from the standpoint of Kent High and they had find another replacement for him. However, the insights Nathan gained from his first year experience through discussion with the research team did allow him to more successfully navigate the complex demands of teaching in another locale. So while Nathan was a leaver from Kent's perspective, this difficult first year did not cause him to leave the profession.

Discussion

We began this research trying to understand the forces at play in the induction of a reform-minded science teacher. In particular, the question that drove this research was **what factors influence how a beginning science teacher negotiates entry into teaching?** Our findings, while very unflattering to this novice teacher and discouraging to those who work with young teachers or teacher preparation, offer useful insights into teacher education programs. It is

important to recognize that Nathan's first year was difficult and, from his perspective, largely unsuccessful. We argue, however, as does Nathan, that much can be learned by frank appraisals of unexpected and negative cases. Nathan acknowledged that he was unprepared to assume a position in a high school earth science class and this placement contributed to his decision to become a "leaver", using Smith and Ingersoll's (2004) terminology, from the district. Had he been hired to teach physics the results may have been different. While a novice teacher's placement during his or her induction years is recognized as a factor influencing his or her satisfaction and/or success, there are factors beyond this one that color a teacher's induction experience. Nathan's case illustrates a stark situation revolving around a poorly placed or poorly prepared teacher and the subsequent identities that form as a result of this placement.

How does a beginning science teacher's identities interact with the teaching context?

In the case of Nathan, we see identity as "a way of being in the world" (Kozoll & Osborne, 2004, p. 158), the way one participates in the world and how others react to that participation (Luehmann, 2007). The cultural context of the school, including the norms and expectations operating in this context, was part of Nathan's world. The way norms and expectations were communicated to and interpreted by Nathan shaped his actions within the context. When he entered the school context he desired to be seen as a self-sufficient teacher who championed students, yet his colleagues did not recognizing him as a novice teacher who fit their expectations of a new community member. People's treatment of Nathan caused him to experience emotional turmoil, and eventually he changed positions. What Nathan's case reveals is the power of cultural context in shaping one's experience.

Echoing McGinnis et al. (2004) and Bianchini and Cavazos (2007), the findings from this study suggest that the cultural context of the school in which this teacher began his professional career heavily influenced the extent to which he enacted reform-based practices. Nathan's

reform-based intent was “washed out” during his early days in teaching because of his difficult context and his need to perform a self-sufficient identity. This study, therefore, supports research that suggests that the school culture influences the degree to which novice teachers can find a professional space in which to refine their teaching practice (Bullough, 1989; Mohr, 2000).

Examining the intersection of identity and context provides insight into the difficulties novice teachers experience. In Nathan, we see that an individual can perform a number of different identities appropriate in different contexts, and these identities can contradict or undermine one another. We can also see that one’s identities can contradict the identity expected in the cultural context of the school. Extending this theme, we also see that clashing identities, such as the inability to perform or be recognized as a particular kind of person (or teacher in this case), results in emotional turmoil. Nathan’s expected institutional identity (that of an inexperienced, compliant novice) clashed with his identity of an idealistic friend and champion of the student as well as that of a reform-minded practitioner. As a result, Nathan pulled away from possible school support (other teachers, administrators, and mentors) and invested himself completely in the two realms in which he could perform his identities successfully--in his classroom and in his graduate work. The audience for his reform-minded identity was that of the university, not the classroom; the audience for the idealistic friend and champion of the student identity was the students in his classroom. This latter identity caused him to privilege personal, social interactions with his students in order to befriend them. He practiced this identity to the extreme, leaving the practices associated with his reform-minded practitioner unused. As students began to reject his friendship (and thus his identity) he pulled away emotionally.

How does the interaction of identity and context shape a novice’s enactment of reform-based science teaching practices?

We argue that a blend of both weak social support and clashing personal and institutional identities created a negative context that led Nathan to search for communities for positive recognition. Collins (2004) explains that when individuals lack an immediate social support, they turn to possible sources of emotional strength. Thus, for Nathan, having graduated out of the support network once provided by his preservice program, graduate school provided a source of immediate social support. Ultimately, pursuing a graduate degree became attractive as he lost his drive to become a community member at Kent High School.

Nathan's emphasis on his identity as idealistic friend and champion of the student, and the lack of emphasis given to planning and classroom management soon made Nathan's classroom a much different place than once he anticipated. Nathan's move to lecture-based teaching required his students to be listeners, negating opportunities for active participation except in reaction to Nathan. Some of the idle students soon posed management problems that Nathan could not remedy. These difficult students contradicted Nathan's identity as competent, self-sufficient teacher and idealistic friend and champion of the student, eliciting negative reactions from both Nathan and the students. This echoes the findings of Brouwers and Tomic (2000) who, from a sample of 253 teachers, found a negative relationship between teachers' self-efficacy in classroom management and their own emotional exhaustion.

As the school year progressed, Nathan became exhausted and disappointed, compromising his willingness to invest himself in this teaching, his motivation to persist in the face of obstacles and defeat, his resilience and endurance to resolve the contradictions in the classroom and in the broader school context (Bandura, 1997; Friedman, 2000). Given this emotional exhaustion, the classroom became a place in which he invested little time, thought or energy—leaving his knowledge of reform minded teaching practice unused. Instead he

completely threw himself into performing his reform minded practitioner identity for his community at the university.

How does the negotiation of identity, context and practice influence a novice teacher's employment decisions?

As described by Friedman (1996), beginning teachers' ineffective experiences can lead them toward (a) a cognitive pathway involving a sense of personal and professional dissatisfaction, and (b) an emotional pathway that evolves into an initial sense of overload, followed by a sense of emotional exhaustion. In the sense of cognitive realization, Nathan attributed most of his sense of discontentment to the contextual factors of his teaching not to his own ineffectiveness. Nathan's sense of overload created a great deal of tension for him, and he came to feel that his position was simply untenable. As a result of his lack of success in performing his champion of the student identity, he decided to leave this classroom at the end of the school year.

It is worth noting that Nathan also appeared to struggle with his identity as a teacher in the overall labor market. While the previous discussion focuses on how Nathan attempted to define his identity as a teacher, he also indicated that he questioned if he would continue his career as a teacher or in some educational related field at all. For Nathan, the faculty meeting early in the school year caused him, for the first time since he graduated high school, to question if he wanted to teach at all. Nathan admits to contemplating other career paths, and spent the remainder of the first semester internally struggling to answer if he would continue to define his professional identity as a teacher.

In many ways, Nathan's case echoes the patterns found by other researchers. Hong (2010) found that teachers with less than five years of experience who left their teaching positions tended to have more negative affective commitments about teaching than their

colleagues who remained. These affective factors included a lower commitment to teaching, weaker teacher efficacy, lower perceptions of task value (i.e., teaching), more negative perception of their relationships in school, and more emotional exhaustion than teachers who remained in teaching.

While Nathan's decision to leave Kent High is understandable given the nature of his first year, the cost this decision had for his school and its students is noteworthy. Goldhaber (2007), in his ten-year study of all teachers in North Carolina, found that teachers experience the greatest gains in their teaching effectiveness during the early years of teaching. He explains that students of a teacher with even just one to two years of experience outperform (on standardized tests) students who have a novice teacher by 3 to 7 percent of a standard deviation, and this trend continues for teachers three to five years of experience. Nathan was replaced the year after this study with another novice teacher, so the inability to keep Nathan in this position caused the school to lose the potential improvement Nathan may have experienced in his teaching.

Implications

Rather than understand Nathan as an example of the how "low performing" teachers are prone to leave their schools after the first year (Henry et al., 2011, p. 277), we argue that teacher educators, school districts and policy makers should begin to use insights such as those gleaned from Nathan to better support novices so that the first year of teaching can become a site for learning and further development rather than the end of a teacher's time in the profession. In this section we will discuss the four implications we draw from our findings

Teacher preparation programs need to help novices to understand the dramatic influence that context can have on their teaching practice. The case of Nathan highlights the particular salience context and the culture of the school plays in the induction of a novice. Science teacher educators must recognize that reform-minded novice teachers may start their careers with sets of

goals that may be contradictory within some settings, particularly within the context of accountability that can restrain teacher initiative. Novice teachers who select to work in schools that are most sensitive to accountability measures may experience clashes between their institutional and affinity identities, clashes that may lead novices to abandon their reform-based ideals or abandon their careers as described by Upadhyay (2009). In teacher preparation programs, we must have more of a focus on helping young teachers visualize their work after graduation and their identity within this work. Echoing Varelas et al.'s (2005) study we argue that a close examination of discrepancies with the novice in a challenging school setting can help teacher educators and preservice teachers to be more aware of teacher identities and the influence that the "fit" between one's identity and the teaching context can have on teacher practice. Such awareness needs to be part of novice's selection of their first teaching placements, and not all contexts may be viable places to support the development of novice teachers (Lisahunter, Rossi, Tinning, Flanagan, & Macdonald, 2011). Clearly, as teacher candidates select their first teaching placements such discussions and explorations need to be the center of discussion within programs.

Reform-minded teacher education programs must help students understand how to work effectively in the realities of schools. Upadhyay's (2009) depiction of the tensions experienced by a elementary teacher working in school context heavily influenced by high stakes testing helps remind us of the sometimes stark differences in teaching goals and practices between teaching for deep understanding and teaching with the goal of success on standardized exams. Although a great deal of research suggests that novice teachers need to have rich experiences with reform-based practices in order to be able to maintain such practices in difficult settings (Windschitl, 2003), some researchers have suggested that novices may have to go outside of transitional classrooms to find supportive environments for such teaching (Luehmann, 2007). While such

experiences may be helpful to build students familiarities with reform-based teaching practices, our findings suggest that teacher preparation programs must support novices in understanding and employing the resources that are available in challenging classroom settings. Nathan's inability to evaluate which supports were available in his teaching context may have come from his failure to recognize the value of the work that was being done in this school. We fear this somewhat dismissive attitude may have been fostered in his program, which critiqued the use of high stakes tests and did not allow students to become familiar with the ways many teachers are able to work within this system to teach science in a student-centered manner. Clearly, if young teachers are to be successful in teaching science in ways they became conversant with at the university, part of that preparation must include ways to use these practices within contradictory settings. An important part of this preparation must be to learn from more senior colleagues, not with the goal of simply adopting their practices, but with the intent of learning to accommodate what one does in an effective manner.

Teacher education programs should be restructured to include induction support, and not leave that responsibility to schools or school districts alone. Nathan's case allows us to understand that induction support cannot be left to chance. Nathan's need to perform the self-sufficient identity caused him to avoid situations in which his perceived inadequacies would become apparent and precluded a search for outside ideas or assistance. We suggest that if an induction support program, a professional learning community, needed to be in place before his first placement in which norms were established in which members of a community commonly reflect upon and opening share their teaching practices. Participation in such a program would have allowed him to focusing on successes and difficulties and allow him to seek assistance from others in that group. Such a community may have allowed Nathan to recognize the difficulties he was experiencing, to understand his role in these difficulties, and to seek ways in which his

teaching practices and identities could be modified for better outcomes for all. We suggest that support programs should begin before graduation so that the novices work with individuals they value respect. These mentors and peers can form a community in which one examines and refines their own teaching as they begin student teaching, and this community will continue this work during the first difficult years of teaching, expanding to include suitable members from the school sites. Tools necessary for such communities could include teaching observation rubrics with agreed upon norms for teaching, teaching debriefing sessions, journals, blogs, even technology to allow for virtual observations and discussions, as peers accept employment in a variety of locales. The establishment of such communities should begin within the teacher preparation program, but they must extend long after graduation, requiring us to redefine what we understand to be a sound teacher preparation and requiring us to find different sources of funding to support the continuation of such programs.

Finally, novices must be supported to develop the awareness of the ways in which identity and emotions influence and shape their work as science teachers. Luehman (2007) argues that traditional science teacher education programs “buy into” a strict dichotomy between cognitive understandings and skills and the emotional side of teacher learning and change; programs all-too-often emphasize the cognitive to the exclusion of emotions. This, she explains, leaves the novice to sort out the emotionally charged aspects of teaching on their own. We suggest that teacher education programs should allow novices to understand the role both positive and negative emotions play in shaping their work as teachers. With such awareness and the support of their “significant narrators” during student teaching and their first years of teaching, novices can be supported in reflecting on and changing their reactions in potentially counterproductive situations. Yes, the induction into the teaching profession can be difficult, but we argue that an examination for the reasons behind this difficulty may provide novices the knowledge they will

need to successfully navigate this period to access resources needed to continue to develop as science teaching practitioners.

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Table: 1: Data Collection Tools

Tool	Topic/Title
Open Ended Questionnaire	<ol style="list-style-type: none"> 1. Teaching Philosophy and Background 2. Beliefs about Teaching and Learning Science 3. Beliefs about Science Education Reform 4. Self-Efficacy Beliefs 5. Pedagogical Discontentment 6. Context 7. University Professor 8. Mentor Teacher 9. Coworker
Primary participant interviews (informal and semi-structured)	<ol style="list-style-type: none"> 1. Background (1 interview) 2. Teaching Philosophy and Beliefs (3 interviews) 3. After Class Observation (2 interviews) 4. General School Context (1 interview) 5. Pedagogical Discontentment (3 interviews) 6. Self-Efficacy (3 interviews) 7. Beliefs about Reform (3 interviews) 8. Mentor Teacher (1 interview) 9. Group Interview (1 interview) 10. Emerging Interviews (Addressing Contradictions) (2 interviews)
Classroom Observations	<ol style="list-style-type: none"> 1. Physical Environment (1 observation) 2. General Teaching Observations (4 observations) 3. Full Unit Teaching Observation (5 observations)
School Observations	Informal observations conducted during the course of the study (cafeteria, school main office, hallways and teachers' lounge)